

February 9, 2012

Mr. Gary Krueger  
Minnesota Pollution Control Agency  
520 Lafayette Road  
St. Paul, Minnesota 55155

**Re: Vapor Intrusion Evaluation: Phase 2A Results and Phase 2B Work Plan  
East Hennepin Avenue Site, Minneapolis, Minnesota**

Dear Mr. Krueger:

On behalf of General Mills, Inc. (General Mills), Barr Engineering Co. (Barr) prepared a *Vapor Intrusion Evaluation Work Plan* dated September 2011 (September 2011 VI Work Plan) for the East Hennepin Avenue site located at 2010 East Hennepin Avenue in Minneapolis, Minnesota (the Site) as part of ongoing site closure evaluations. The Site location is shown on Figure 1. The September 2011 VI Work Plan laid out a phased approach to evaluate the vapor intrusion potential at the Site. The first phase of vapor intrusion investigative field work used the existing site monitoring well network (Phase 2A) and was completed in the autumn of 2011. Results were shared with the Minnesota Pollution Control Agency (MPCA) at a meeting on December 12, 2011, and MPCA and General Mills agreed the results from the first phase of work indicated that the next phase of investigation work (Phase 2B) was necessary. Phase 2B includes the investigation of groundwater and soil gas at selected locations onsite and this phase has been modified to also include offsite work near well S.

This letter summarizes the results from the first phase of vapor intrusion investigation work (Phase 2A) and presents a proposed plan for conducting the next phase (Phase 2B) of vapor intrusion investigation work in accordance with the framework described in the September 2011 VI Work Plan. Note that Phase 1 was a desktop evaluation of known Site conditions.

### **Phase 2A Results**

In the autumn of 2011, groundwater and soil gas samples were collected south and southeast of the Site using selected existing monitoring wells screened in the glacial drift aquifer to preliminarily evaluate the potential for vapor intrusion in accordance with the September 2011 VI Work Plan.

Groundwater samples were collected with passive diffusion bag samplers to create a vertical profile of TCE concentrations in groundwater at six selected glacial drift wells (wells 112, 2, S, T, V, and W). The locations of the sampled wells are shown on Figure 2. Well T was sampled as a control as TCE concentrations have been non-detect in groundwater at that location since the 1980s.

Soil gas samples were collected for laboratory analysis of TCE in five selected glacial drift wells screened at the water table (i.e., a portion of the well screen is above the water table). The wells sampled as part of this effort were wells 2, S, T, V, and W. The locations of the wells are shown on Figure 3.

Results of the investigation are summarized in Table 1 and laboratory reports are included in Attachment A.

The results of the vertical groundwater profiling work are shown on Figure 2. TCE concentrations increased with water column depth at wells S, V, and W but were generally consistent through the sampled water column at wells 112 and 2.

Soil gas sampling results are shown on Figure 3. TCE was present in soil gas at concentrations exceeding the MPCA screening criteria of 10 times the Intrusion Screening Value (10X ISV; 30 ug/m<sup>3</sup>) for three out of the five locations sampled (wells 2, S, and V). The soil gas results are likely “worst case” as samples were collected from the capillary zone rather than at a minimum of two feet above the water table.

The TCE concentration in the uppermost groundwater interval did not correlate well with measured soil gas concentrations. For example, the uppermost TCE concentration in groundwater at wells 2 (8.3 ug/L) and V (<1.0 ug/L) were below MPCA’s Groundwater Intrusion Screening Value (GW<sub>ISV</sub>) of 20 ug/L; however, soil gas samples collected from both of those wells (810 ug/m<sup>3</sup> in well 2; 110 ug/m<sup>3</sup> in well V) were above 10X ISV for TCE (30 ug/m<sup>3</sup>). The TCE concentration of groundwater samples collected during the annual monitoring events at the Site since 2005 using “standard” methods, which are “composite” samples collected across the screened interval, appear to be a better indicator of corresponding soil gas concentrations collected from the capillary zone as shown on Table 1.

Based on these results, MPCA and General Mills agreed at the December 12, 2011 meeting that additional groundwater and soil gas investigation at selected onsite and offsite locations was necessary as outlined in the September 2011 VI Work Plan.

## Phase 2B Work Plan

The intent of the Phase 2B work plan is to continue to evaluate the vapor intrusion potential from groundwater contaminated with TCE acting as the source. General Mills understands that any residual soil contamination at the former disposal pit located at the southern edge of the Site also has the potential to act as a source, particularly for onsite buildings. General Mills plans to conduct additional investigation work near onsite buildings after results of the investigation work described in this work plan have been received.

The Phase 2A work included soil gas samples collected immediately above the water table from the capillary zone. Generally, soil gas investigation protocols focus on collecting soil gas samples from higher up in the soil column. Phase 2B will do this at select locations on and off site. The soil gas samples will be paired with samples of underlying groundwater. Groundwater samples used for this comparison will be sampled from two existing monitoring wells and from one temporary monitoring well installed using direct-push technology. The soil gas samples will be collected from temporary soil gas monitoring points also installed using direct-push technology.

Glacial drift monitoring well B is one of the few remaining onsite monitoring wells. Historically, samples from this well contained TCE concentrations above the GW<sub>ISV</sub>, indicating this might be a useful location for the Phase 2B effort. However, the well was last sampled in 1993, so a groundwater sample was collected on January 13, 2012 to assess current TCE concentrations in well B. The groundwater sample was submitted to TriMatrix Laboratories of Grand Rapids, Michigan (TriMatrix) for laboratory analysis of TCE by U.S. EPA Method 8260B. Results of the laboratory analysis are included in Attachment A. The concentration of TCE in groundwater was 110 ug/L, above the GW<sub>ISV</sub> screening criteria of 20 ug/L, confirming the location of well B as appropriate for inclusion. The onsite soil gas and groundwater sampling locations presented below were selected based on the presence of TCE above the GW<sub>ISV</sub> at monitoring well B.

### Sampling Locations

Proposed locations for sampling groundwater and soil gas in Phase 2B are shown on Figure 4 and include:

- collection of groundwater and soil gas samples at onsite location DP-1, approximately 150 feet north of monitoring well B;
- collection of soil gas samples at onsite location DP-2, adjacent to monitoring well B;
- collection of a groundwater sample from existing offsite monitoring well S; and
- collection of soil gas samples at DP-3, adjacent to well S.

Permits for work in the right-of-way will be obtained from the City of Minneapolis prior to conducting any drilling work adjacent to monitoring well S and the current Site property owner (BBD Holdings, Inc.) will be notified prior to the on site drilling work.

### Sample Collection

The temporary monitoring well at location DP-1 will be constructed using direct-push equipment. The well screen and casing will be constructed of 1-inch diameter PVC. Based on the depth to water measured in monitoring well B, the temporary monitoring well will be placed to a depth of approximately 25 feet below ground surface (bgs) and screened across the water table. The depth to groundwater will be measured in the temporary monitoring well before and after collecting a groundwater sample. One groundwater sample will be collected from the temporary monitoring well using the procedure described in the Barr Standard Operating Procedure (SOP) for Direct-Push Soil and Groundwater Sample Collection (Attachment B). Groundwater samples will be collected with laboratory supplied containers and sent to TriMatrix for laboratory analysis of TCE by U.S. EPA Method 8260B.

A groundwater sample will be collected from the existing offsite monitoring well S using the procedure described in the Barr SOP for Groundwater Samples from Monitoring Wells (Attachment C).

Using the depth to groundwater measurements at the temporary monitoring well and the existing monitoring well locations (wells B and S), temporary soil gas monitoring points will be installed using direct-push equipment to depths of 4 feet bgs, 8 feet bgs, and 2 feet above the measured groundwater table. Temporary soil gas monitoring points will be constructed with fluoropolymer resin tubing as shown in Figure 5. A soil gas sample will be collected from each temporary soil gas monitoring point as described in the Barr SOP for Air Sample Collection from a Soil Gas Implant (Attachment D). The soil gas samples will be collected with laboratory prepared Summa canisters and submitted to Columbia Analytical Services of Simi Valley, California for laboratory analysis of TCE using U.S. EPA Method TO-15.

After samples are collected at the temporary monitoring well and temporary soil gas monitoring point locations, temporary well casing materials and non-expendable direct-push tools used below ground surface will be removed. The annular space will be sealed with grout according to State of Minnesota requirements.

### Schedule and Reporting

Sampling will be conducted in March 2012 as weather conditions allow and following MPCA review and approval of this work plan. Results will be shared with MPCA once they are received and a path forward will be discussed with the MPCA prior to conducting any additional work. It is anticipated that results will be available approximately three weeks after completion of the investigation work.

Please contact Sara Ramsden at (952) 832-2877 or [sramsden@barr.com](mailto:sramsden@barr.com) with any questions.

Sincerely,



Brad Schwie, P.E.  
Senior Geological Engineer



Sara Ramsden, P.E.  
Project Manager

### Enclosures

Table 1 – Vertical Groundwater Quality Profile and Soil Vapor Investigation Summary  
Figure 1 – Site Location Map  
Figure 2 – Vertical Groundwater Profiling Results, November 2011  
Figure 3 – Soil Gas Investigation Results, November 2011  
Figure 4 – Proposed Temporary Monitoring Well and Soil Gas Monitoring Point Locations – VI  
Phase 2B Work Plan  
Figure 5 – Temporary Soil Gas Monitoring Point Schematic  
Attachment A – Laboratory Analytical Reports  
Attachment B – SOP for Direct-Push Soil and Groundwater Sample Collection  
Attachment C – SOP for Groundwater Samples from Monitoring Wells  
Attachment D – SOP for Air Sample Collection from a Soil Gas Implant

c: Fred Campbell, MPCA  
Paul Zattoni, General Mills  
Larry Deeney, General Mills

## Tables

**Table 1**  
**Vertical Groundwater Quality Profile and Soil Vapor Investigation Summary**  
**East Hennepin Avenue Site**  
**Minneapolis, MN**

Wells Sampled	Top of Casing Elevation (ft MSL)	Screen Length (ft)	Top of Screen Elevation (ft MSL)	Bottom of Screen Elevation (ft MSL)	Depth to Water (10/25/2011) (ft btoc)	Water Table Elevation (10/25/2011) (ft MSL)	No. of PDBs Deployed	Sampling Interval of Shallow Water Column (ft)	TCE Concentration in Groundwater (11/14/2011) (ug/L)	Average TCE Concentration in Groundwater (2005-2011) (ug/L)	TCE Concentration in Soil Vapor (11/18/2011) (ug/m <sup>3</sup> )
112 <sup>(a)</sup>	841.37	20.0	824.5	804.5	15.88	825.49	5	0-1 <sup>(b)</sup>	8.0	33	--
								1-2	8.8		
								5-7	10		
								12-14	6.8		
								18-20	7.8		
2 <sup>(c)</sup>	857.21	10.0	838.0	828.0	19.75	837.46	3	0-1	8.3	--	810
								1-2	8.1		
								4-6	7.7		
S	848.15	10.0	831.8	821.8	17.03	831.12	3	0-1	55	101	2,600
								1-2	69		
								7-9	79		
T	849.36	10.0	835.3	825.3	15.80	833.56	1	0-2	<1.0	< 1	1.5
V	838.59	10.0	821.4	811.4	19.36	819.23	4	0-1	<1.0	26	110
								1-2	1.7		
								2.5-4.5	30		
								5.5-7.5	38		
W	830.78	10.0	822.1	812.1	11.85	818.93	3	0-1	2.4	5.9	0.8
								1-2	3.3		
								4.5-6.5	6.6		

**Notes:**

btoc = below top of casing

PDB = Passive diffusion bag sampler

PDBs were deployed on 10/31/2011 and removed and sampled on 11/14/2011.

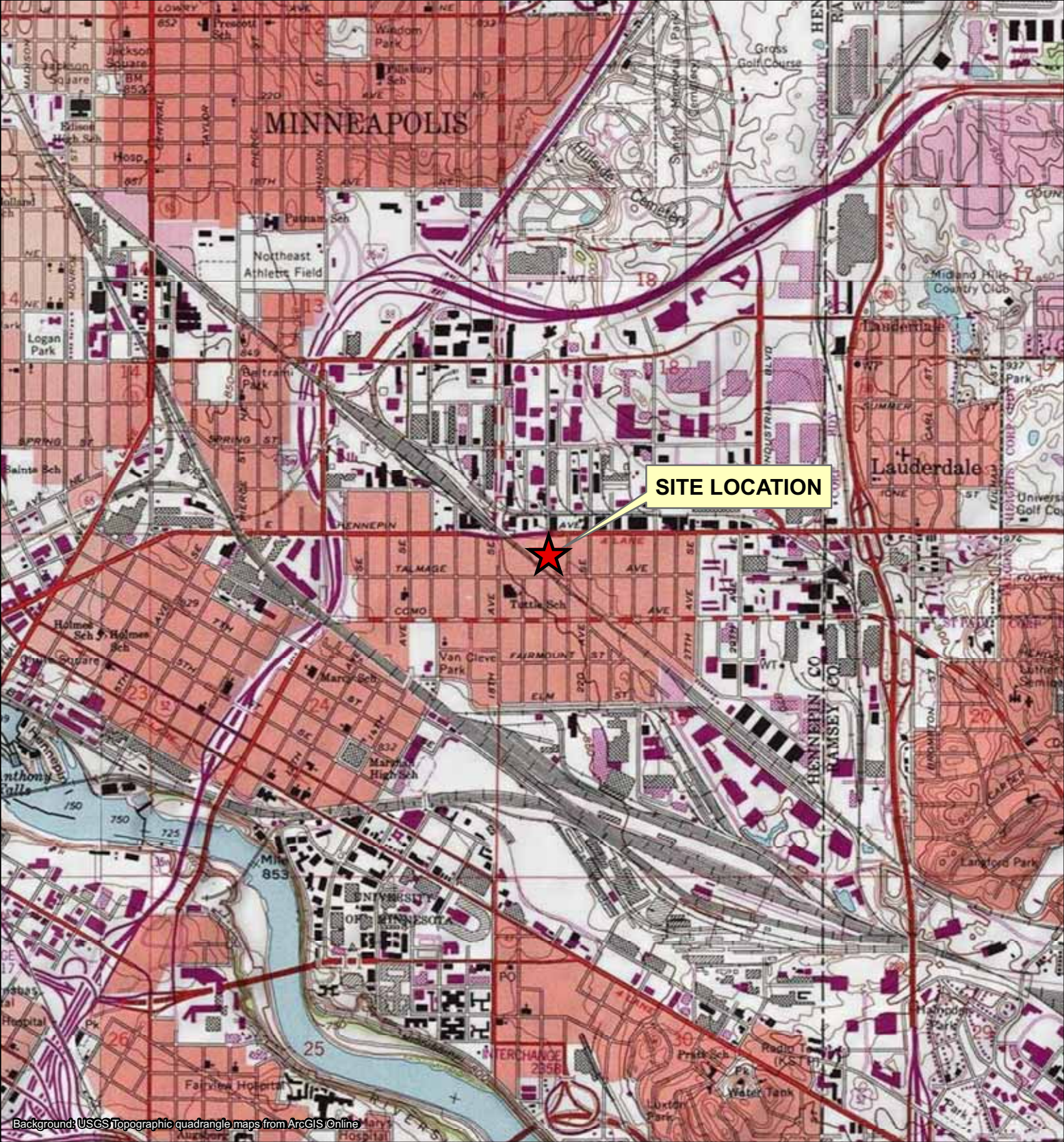
Soil vapor sampling was conducted 11/18/2011.

(a) = Well screen is submerged - soil vapor sample could not be collected. The PDB sample collected from 1-2' in the water column is at the top of the screened interval.

(b) = Duplicate sample from the same PDB collected at this location

(c) = Well 2 has not been sampled since 1983.

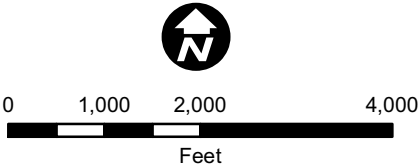
## Figures

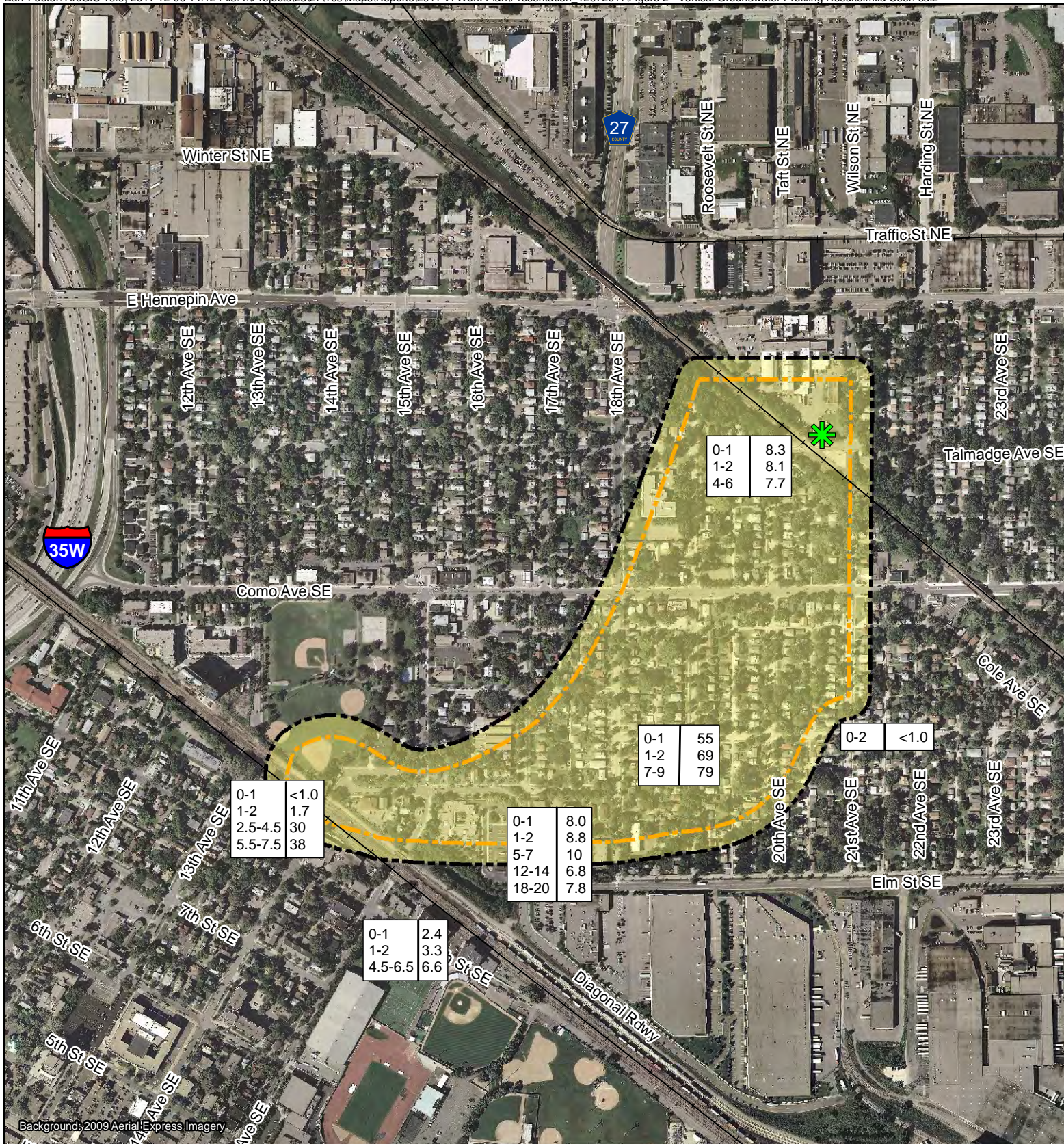


Background: USGS Topographic quadrangle maps from ArcGIS Online

Figure 1

SITE LOCATION MAP  
East Hennepin Avenue Site  
Minneapolis, Minnesota





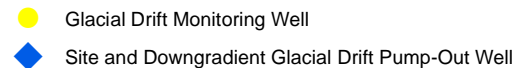
Former Disposal Site



TCE Concentrations >20 ug/L (GW<sub>ISV</sub>) in Glacial Drift



Potential Receptor Survey Area - 100-foot Setback from TCE Concentrations >20 ug/L (GW<sub>ISV</sub>) in Glacial Drift



4.8 Trichloroethylene Concentration (TCE) (ug/L)  
Averaged from 2005 to July 2011 (Well 2 not sampled during this time period.)

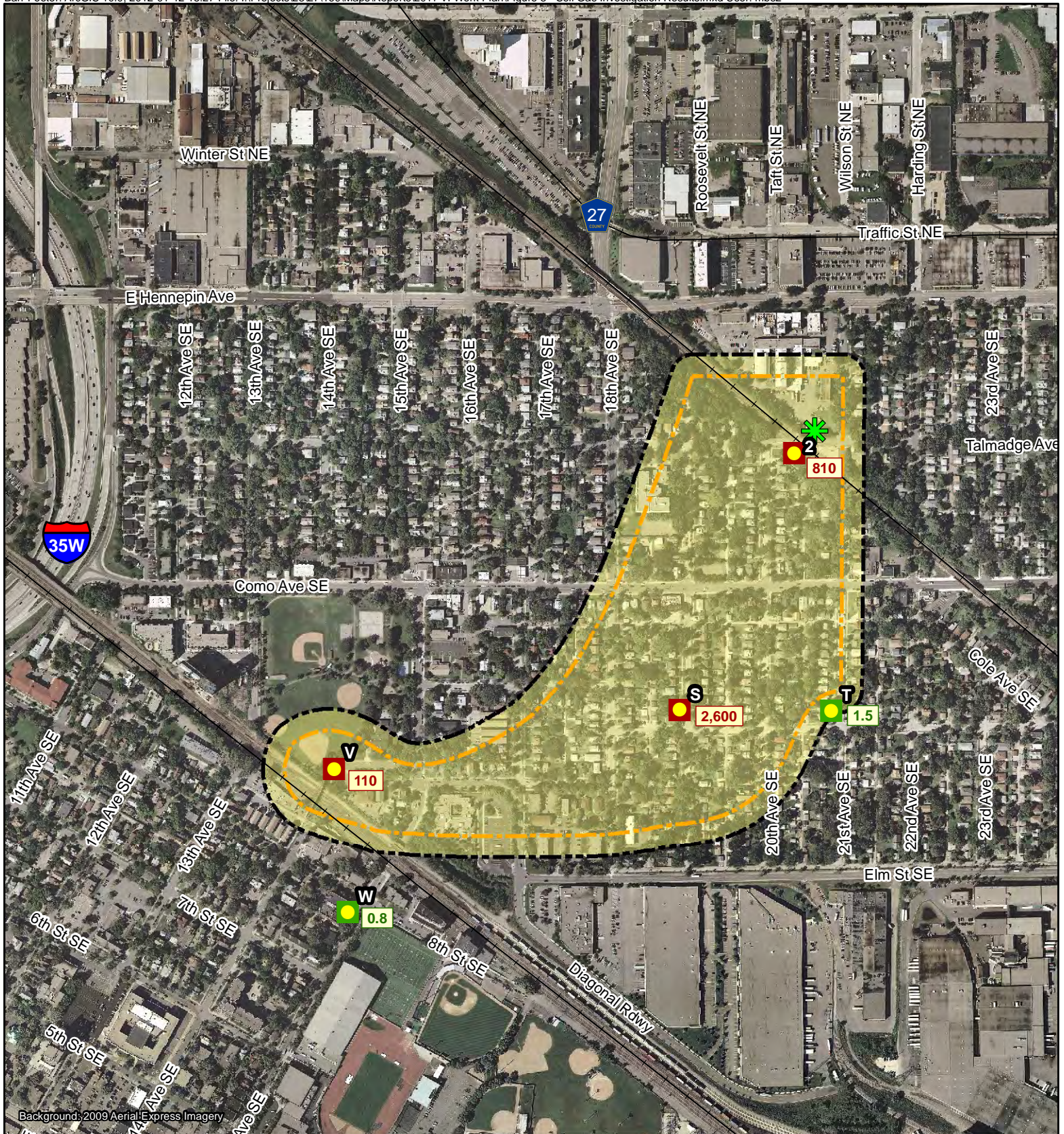
Sampling interval of shallow water column (ft)	TCE concentration in groundwater (11/14/2011) (ug/L)
0-1	2.4
1-2	3.3
4.5-6.5	6.6



0 300 600 1,200  
Feet

Figure 2

VERTICAL GROUNDWATER  
PROFILING RESULTS,  
NOVEMBER 2011  
East Hennepin Avenue Site  
Minneapolis, Minnesota



Former Disposal Site



Glacial Drift Monitoring Well

110

Trichloroethylene Concentration (TCE) (ug/m<sup>3</sup>) in Soil Gas 11/18/2011



Soil Gas TCE Concentration Above Screening Value (30 ug/m<sup>3</sup>)



Soil Gas TCE Concentration Below Screening Value (30 ug/m<sup>3</sup>)



TCE Concentrations >20 ug/L (GW<sub>isv</sub>) in Glacial Drift



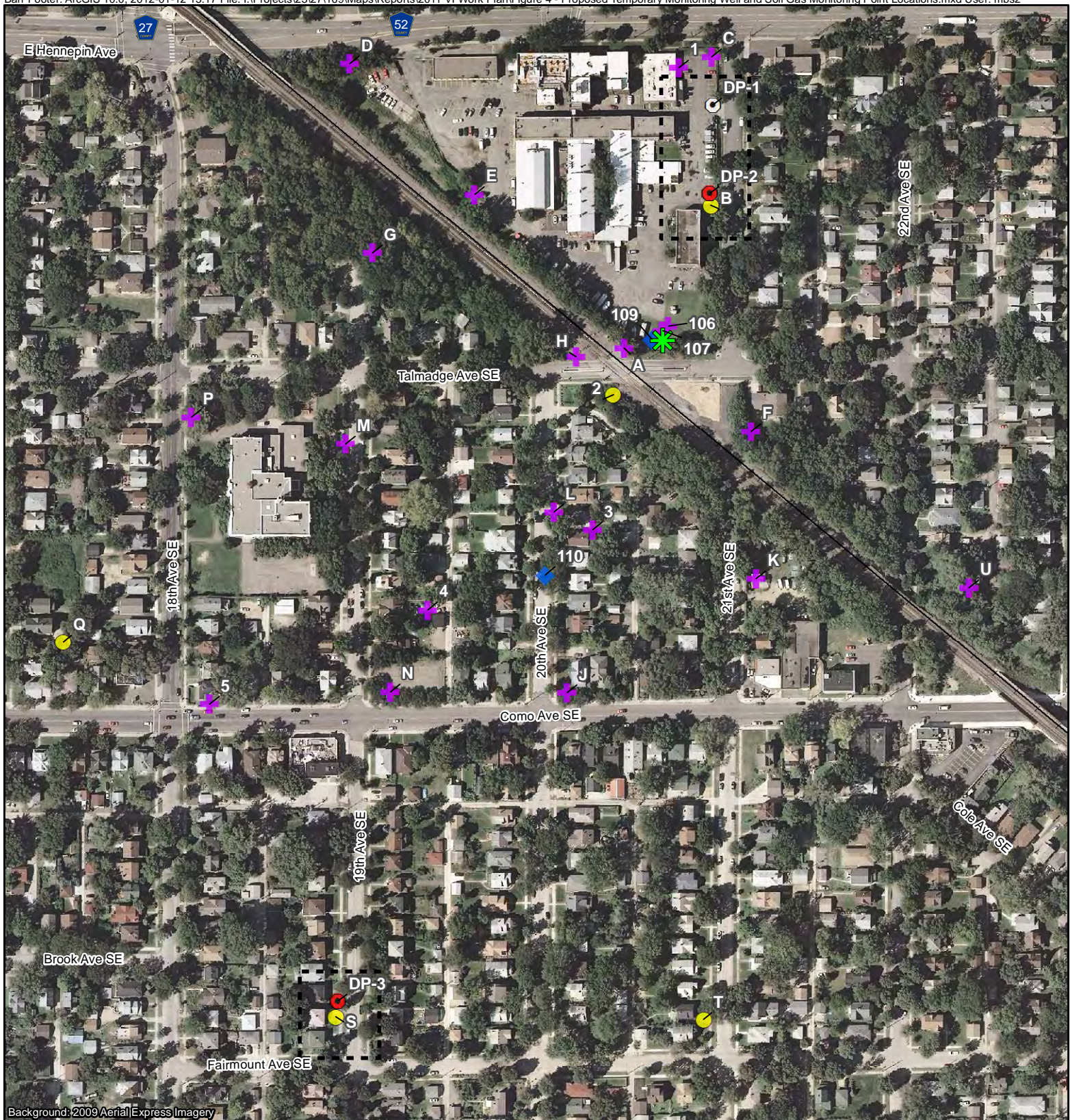
Potential Receptor Survey Area - 100-foot Setback from TCE Concentrations >20 ug/L (GW<sub>isv</sub>) in Glacial Drift



0 300 600 1,200  
Feet

Figure 3

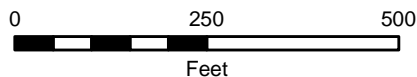
SOIL GAS INVESTIGATION RESULTS,  
NOVEMBER 2011  
East Hennepin Avenue Site  
Minneapolis, Minnesota



- Former Disposal Site
- Temporary Monitoring Well and Soil Gas Monitoring Point
- Temporary Soil Gas Monitoring Point
- Glacial Drift Well
- Former Glacial Drift Well (sealed or lost)
- Glacial Drift Pump-Out Well
- VI Phase 2B Work Area

Figure 4

PROPOSED TEMPORARY  
MONITORING WELL AND  
SOIL GAS MONITORING  
POINT LOCATIONS -  
VI PHASE 2B WORK PLAN  
East Hennepin Avenue Site  
Minneapolis, Minnesota



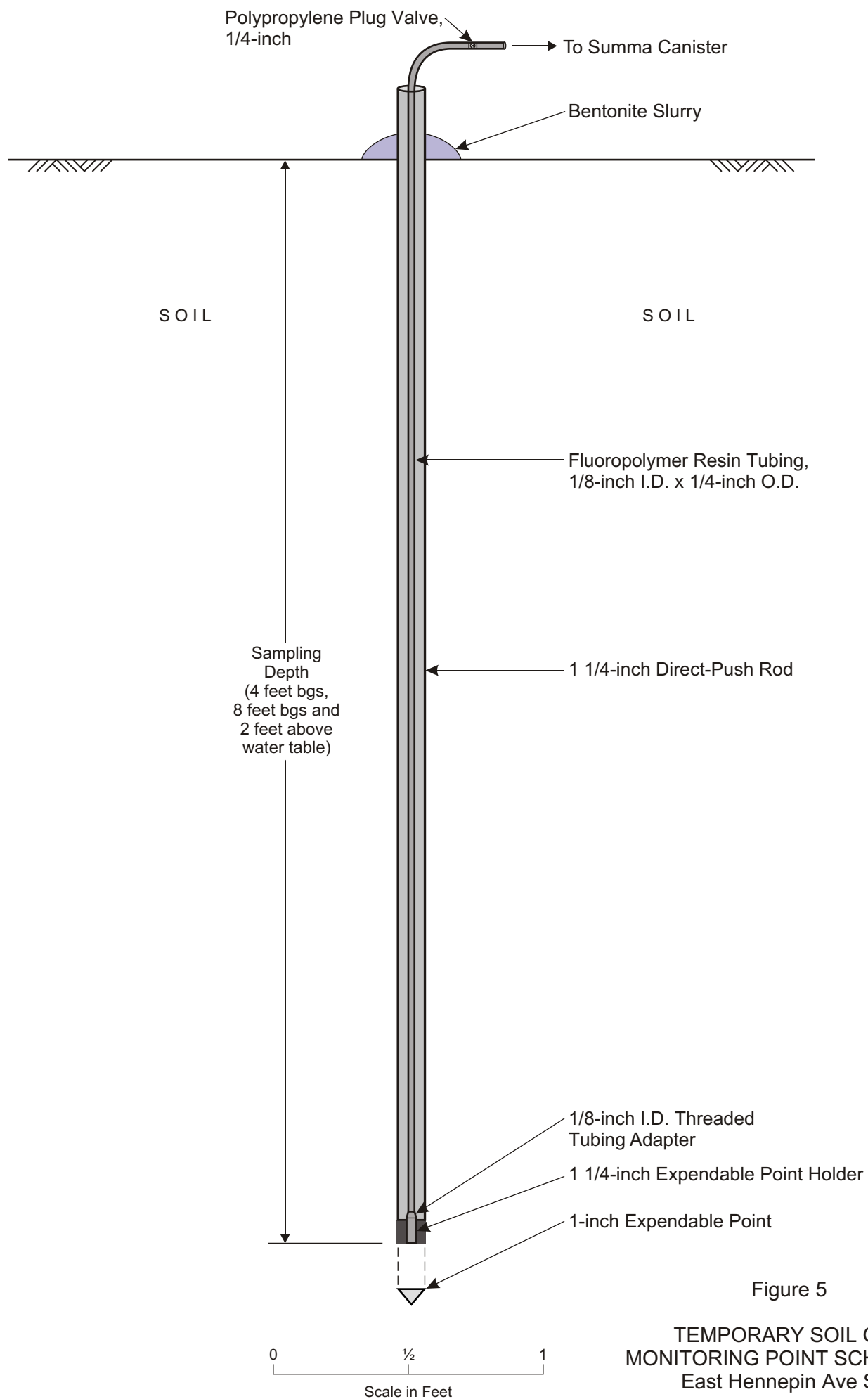


Figure 5

TEMPORARY SOIL GAS  
MONITORING POINT SCHEMATIC  
East Hennepin Ave Site

## **Attachments**

## **Attachment A**

### **Laboratory Analytical Reports**

November 23, 2011

Barr Engineering Company  
Attn: Michael Dupay  
4700 West 77th Street  
Minneapolis, MN 55435

**Project: 23/27-169407:General Mills MN Cert. #026-999-161**

Dear Michael Dupay,

Enclosed is a copy of the laboratory report, comprised of the following work order(s), for test samples received by TriMatrix Laboratories:

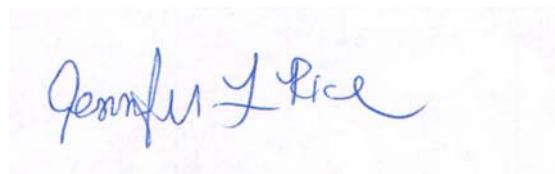
<b>Work Order</b>	<b>Received</b>	<b>Description</b>
1111290	11/15/2011	Laboratory Services

This report relates only to the sample(s), as received. Test results are in compliance with the requirements of the National Environmental Laboratory Accreditation Conference (NELAC). Any qualifications of results, including sample acceptance requirements, are explained in the Statement of Data Qualifications.

Estimates of analytical uncertainties for the test results contained within this report are available upon request.

If you have any questions or require further information, please do not hesitate to contact me.

Sincerely,



Jennifer L. Rice  
Project Chemist

Enclosures(s)

## ANALYTICAL REPORT

Client: <b>Barr Engineering Company</b>	Work Order: <b>1111290</b>
Project: 23/27-169407:General Mills MN Cert. #026-999	Description: Laboratory Services
Client Sample ID: <b>T-16-18</b>	Sampled: 11/14/11 09:20
Lab Sample ID: <b>1111290-01</b>	Sampled By: KSJ
Matrix: Water	Received: 11/15/11 09:00
Unit: ug/L	Prepared: 11/21/11 By: DLV
Dilution Factor: 1	Analyzed: 11/21/11 By: DLV
QC Batch: 1113349	Analytical Batch: 1K22022

### Volatile Organic Compounds by EPA Method 8260B

CAS Number	Analyte	Analytical Result		RL
79-01-6	Trichloroethene	<1.0		1.0
<i>Surrogates:</i>		<i>% Recovery</i>	<i>Control Limits</i>	
	<i>Dibromofluoromethane</i>	107	88-116	
	<i>1,2-Dichloroethane-d4</i>	99	87-123	
	<i>Toluene-d8</i>	99	91-107	
	<i>4-Bromofluorobenzene</i>	94	84-106	

## ANALYTICAL REPORT

Client: <b>Barr Engineering Company</b>	Work Order: <b>1111290</b>
Project: 23/27-169407:General Mills MN Cert. #026-999	Description: Laboratory Services
Client Sample ID: <b>S-17-18</b>	Sampled: 11/14/11 09:40
Lab Sample ID: <b>1111290-02</b>	Sampled By: KSJ
Matrix: Water	Received: 11/15/11 09:00
Unit: ug/L	Prepared: 11/21/11 By: DLV
Dilution Factor: 1	Analyzed: 11/21/11 By: DLV
QC Batch: 1113349	Analytical Batch: 1K22022

### Volatile Organic Compounds by EPA Method 8260B

CAS Number	Analyte	Analytical Result		RL
79-01-6	Trichloroethene	55		1.0
<b>Surrogates:</b>		<b>% Recovery</b>	<b>Control Limits</b>	
	<i>Dibromofluoromethane</i>	106	88-116	
	<i>1,2-Dichloroethane-d4</i>	99	87-123	
	<i>Toluene-d8</i>	99	91-107	
	<i>4-Bromofluorobenzene</i>	95	84-106	

## ANALYTICAL REPORT

Client:	<b>Barr Engineering Company</b>	Work Order:	<b>1111290</b>
Project:	23/27-169407:General Mills MN Cert. #026-999	Description:	Laboratory Services
Client Sample ID:	<b>S-18-19</b>	Sampled:	11/14/11 09:45
Lab Sample ID:	<b>1111290-03</b>	Sampled By:	KSJ
Matrix:	Water	Received:	11/15/11 09:00
Unit:	ug/L	Prepared:	11/21/11 By: DLV
Dilution Factor:	1	Analyzed:	11/21/11 By: DLV
QC Batch:	1113349	Analytical Batch:	1K22022

### Volatile Organic Compounds by EPA Method 8260B

CAS Number	Analyte	Analytical Result		RL
79-01-6	Trichloroethene	69		1.0
Surrogates:		% Recovery	Control Limits	
	Dibromofluoromethane	107	88-116	
	1,2-Dichloroethane-d4	101	87-123	
	Toluene-d8	99	91-107	
	4-Bromofluorobenzene	94	84-106	

## ANALYTICAL REPORT

Client:	Barr Engineering Company	Work Order:	1111290
Project:	23/27-169407:General Mills MN Cert. #026-999	Description:	Laboratory Services
Client Sample ID:	S-24-26	Sampled:	11/14/11 09:50
Lab Sample ID:	1111290-04	Sampled By:	KSJ
Matrix:	Water	Received:	11/15/11 09:00
Unit:	ug/L	Prepared:	11/21/11 By: DLV
Dilution Factor:	1	Analyzed:	11/21/11 By: DLV
QC Batch:	1113349	Analytical Batch:	1K22022

### Volatile Organic Compounds by EPA Method 8260B

CAS Number	Analyte	Analytical Result		RL
79-01-6	Trichloroethene	79		1.0
Surrogates:		% Recovery	Control Limits	
	Dibromofluoromethane	107	88-116	
	1,2-Dichloroethane-d4	100	87-123	
	Toluene-d8	99	91-107	
	4-Bromofluorobenzene	94	84-106	

## ANALYTICAL REPORT

Client:	Barr Engineering Company	Work Order:	1111290
Project:	23/27-169407:General Mills MN Cert. #026-999	Description:	Laboratory Services
Client Sample ID:	V-19.5-20.5	Sampled:	11/14/11 10:05
Lab Sample ID:	1111290-05	Sampled By:	KSJ
Matrix:	Water	Received:	11/15/11 09:00
Unit:	ug/L	Prepared:	11/21/11 By: DLV
Dilution Factor:	1	Analyzed:	11/21/11 By: DLV
QC Batch:	1113349	Analytical Batch:	1K22022

### Volatile Organic Compounds by EPA Method 8260B

CAS Number	Analyte	Analytical Result		RL
79-01-6	Trichloroethene	<1.0		1.0
<i>Surrogates:</i>		<i>% Recovery</i>	<i>Control Limits</i>	
	<i>Dibromofluoromethane</i>	107	88-116	
	<i>1,2-Dichloroethane-d4</i>	102	87-123	
	<i>Toluene-d8</i>	100	91-107	
	<i>4-Bromofluorobenzene</i>	94	84-106	

## ANALYTICAL REPORT

Client: <b>Barr Engineering Company</b>	Work Order: <b>1111290</b>
Project: 23/27-169407:General Mills MN Cert. #026-999	Description: Laboratory Services
Client Sample ID: <b>V-20.5-21.5</b>	Sampled: 11/14/11 10:10
Lab Sample ID: <b>1111290-06</b>	Sampled By: KSJ
Matrix: Water	Received: 11/15/11 09:00
Unit: ug/L	Prepared: 11/21/11 By: DLV
Dilution Factor: 1	Analyzed: 11/22/11 By: DLV
QC Batch: 1113349	Analytical Batch: 1K22022

### Volatile Organic Compounds by EPA Method 8260B

CAS Number	Analyte	Analytical Result		RL
79-01-6	Trichloroethene	1.7		1.0
<i>Surrogates:</i>		<i>% Recovery</i>	<i>Control Limits</i>	
	<i>Dibromofluoromethane</i>	107	88-116	
	<i>1,2-Dichloroethane-d4</i>	100	87-123	
	<i>Toluene-d8</i>	99	91-107	
	<i>4-Bromofluorobenzene</i>	94	84-106	

## ANALYTICAL REPORT

Client:	<b>Barr Engineering Company</b>	Work Order:	<b>1111290</b>
Project:	23/27-169407:General Mills MN Cert. #026-999	Description:	Laboratory Services
Client Sample ID:	<b>V-22-24</b>	Sampled:	11/14/11 10:15
Lab Sample ID:	<b>1111290-07</b>	Sampled By:	KSJ
Matrix:	Water	Received:	11/15/11 09:00
Unit:	ug/L	Prepared:	11/21/11 By: DLV
Dilution Factor:	1	Analyzed:	11/22/11 By: DLV
QC Batch:	1113349	Analytical Batch:	1K22022

### Volatile Organic Compounds by EPA Method 8260B

CAS Number	Analyte	Analytical Result		RL
79-01-6	Trichloroethene	30		1.0
<i>Surrogates:</i>		<i>% Recovery</i>	<i>Control Limits</i>	
	<i>Dibromofluoromethane</i>	107	88-116	
	<i>1,2-Dichloroethane-d4</i>	100	87-123	
	<i>Toluene-d8</i>	98	91-107	
	<i>4-Bromofluorobenzene</i>	92	84-106	

## ANALYTICAL REPORT

Client: <b>Barr Engineering Company</b>	Work Order: <b>1111290</b>
Project: 23/27-169407:General Mills MN Cert. #026-999	Description: Laboratory Services
Client Sample ID: <b>V-25-27</b>	Sampled: 11/14/11 10:20
Lab Sample ID: <b>1111290-08</b>	Sampled By: KSJ
Matrix: Water	Received: 11/15/11 09:00
Unit: ug/L	Prepared: 11/21/11 By: DLV
Dilution Factor: 1	Analyzed: 11/22/11 By: DLV
QC Batch: 1113349	Analytical Batch: 1K22022

### Volatile Organic Compounds by EPA Method 8260B

CAS Number	Analyte	Analytical Result		RL
79-01-6	Trichloroethene	38		1.0
<i>Surrogates:</i>		<i>% Recovery</i>	<i>Control Limits</i>	
	<i>Dibromofluoromethane</i>	108	88-116	
	<i>1,2-Dichloroethane-d4</i>	102	87-123	
	<i>Toluene-d8</i>	100	91-107	
	<i>4-Bromofluorobenzene</i>	94	84-106	

## ANALYTICAL REPORT

Client: <b>Barr Engineering Company</b>	Work Order: <b>1111290</b>
Project: 23/27-169407:General Mills MN Cert. #026-999	Description: Laboratory Services
Client Sample ID: <b>W-12-13</b>	Sampled: 11/14/11 10:40
Lab Sample ID: <b>1111290-09</b>	Sampled By: KSJ
Matrix: Water	Received: 11/15/11 09:00
Unit: ug/L	Prepared: 11/21/11 By: DLV
Dilution Factor: 1	Analyzed: 11/22/11 By: DLV
QC Batch: 1113349	Analytical Batch: 1K22022

### Volatile Organic Compounds by EPA Method 8260B

CAS Number	Analyte	Analytical Result		RL
79-01-6	Trichloroethene	2.4		1.0
<i>Surrogates:</i>		<i>% Recovery</i>	<i>Control Limits</i>	
	<i>Dibromofluoromethane</i>	107	88-116	
	<i>1,2-Dichloroethane-d4</i>	101	87-123	
	<i>Toluene-d8</i>	99	91-107	
	<i>4-Bromofluorobenzene</i>	94	84-106	

## ANALYTICAL REPORT

Client:	Barr Engineering Company	Work Order:	1111290
Project:	23/27-169407:General Mills MN Cert. #026-999	Description:	Laboratory Services
Client Sample ID:	W-13-14	Sampled:	11/14/11 10:45
Lab Sample ID:	1111290-10	Sampled By:	KSJ
Matrix:	Water	Received:	11/15/11 09:00
Unit:	ug/L	Prepared:	11/21/11 By: DLV
Dilution Factor:	1	Analyzed:	11/22/11 By: DLV
QC Batch:	1113349	Analytical Batch:	1K22022

### Volatile Organic Compounds by EPA Method 8260B

CAS Number	Analyte	Analytical Result		RL
79-01-6	Trichloroethene	3.3		1.0
<b>Surrogates:</b>		<b>% Recovery</b>	<b>Control Limits</b>	
	Dibromofluoromethane	108	88-116	
	1,2-Dichloroethane-d4	100	87-123	
	Toluene-d8	98	91-107	
	4-Bromofluorobenzene	93	84-106	

## ANALYTICAL REPORT

Client:	Barr Engineering Company	Work Order:	1111290
Project:	23/27-169407:General Mills MN Cert. #026-999	Description:	Laboratory Services
Client Sample ID:	W-16.5-18.5	Sampled:	11/14/11 10:50
Lab Sample ID:	1111290-11	Sampled By:	KSJ
Matrix:	Water	Received:	11/15/11 09:00
Unit:	ug/L	Prepared:	11/21/11 By: DLV
Dilution Factor:	1	Analyzed:	11/22/11 By: DLV
QC Batch:	1113349	Analytical Batch:	1K22022

### Volatile Organic Compounds by EPA Method 8260B

CAS Number	Analyte	Analytical Result		RL
79-01-6	Trichloroethene	6.6		1.0
<i>Surrogates:</i>		<i>% Recovery</i>	<i>Control Limits</i>	
	<i>Dibromofluoromethane</i>	108	88-116	
	<i>1,2-Dichloroethane-d4</i>	101	87-123	
	<i>Toluene-d8</i>	99	91-107	
	<i>4-Bromofluorobenzene</i>	93	84-106	

## ANALYTICAL REPORT

Client: <b>Barr Engineering Company</b>	Work Order: <b>1111290</b>
Project: 23/27-169407:General Mills MN Cert. #026-999	Description: Laboratory Services
Client Sample ID: <b>2-20-21</b>	Sampled: 11/14/11 11:20
Lab Sample ID: <b>1111290-12</b>	Sampled By: KSJ
Matrix: Water	Received: 11/15/11 09:00
Unit: ug/L	Prepared: 11/21/11 By: DLV
Dilution Factor: 1	Analyzed: 11/22/11 By: DLV
QC Batch: 1113349	Analytical Batch: 1K22022

### Volatile Organic Compounds by EPA Method 8260B

CAS Number	Analyte	Analytical Result		RL
79-01-6	Trichloroethene	8.3		1.0
<b>Surrogates:</b>		<b>% Recovery</b>	<b>Control Limits</b>	
	<i>Dibromofluoromethane</i>	108	88-116	
	<i>1,2-Dichloroethane-d4</i>	101	87-123	
	<i>Toluene-d8</i>	99	91-107	
	<i>4-Bromofluorobenzene</i>	95	84-106	

## ANALYTICAL REPORT

Client: <b>Barr Engineering Company</b>	Work Order: <b>1111290</b>
Project: 23/27-169407:General Mills MN Cert. #026-999	Description: Laboratory Services
Client Sample ID: <b>2-21-22</b>	Sampled: 11/14/11 11:25
Lab Sample ID: <b>1111290-13</b>	Sampled By: KSJ
Matrix: Water	Received: 11/15/11 09:00
Unit: ug/L	Prepared: 11/21/11 By: DLV
Dilution Factor: 1	Analyzed: 11/22/11 By: DLV
QC Batch: 1113349	Analytical Batch: 1K22022

### Volatile Organic Compounds by EPA Method 8260B

CAS Number	Analyte	Analytical Result		RL
79-01-6	Trichloroethene	8.1		1.0
<i>Surrogates:</i>		<i>% Recovery</i>	<i>Control Limits</i>	
	<i>Dibromofluoromethane</i>	107	88-116	
	<i>1,2-Dichloroethane-d4</i>	100	87-123	
	<i>Toluene-d8</i>	99	91-107	
	<i>4-Bromofluorobenzene</i>	95	84-106	

## ANALYTICAL REPORT

Client: <b>Barr Engineering Company</b>	Work Order: <b>1111290</b>
Project: 23/27-169407:General Mills MN Cert. #026-999	Description: Laboratory Services
Client Sample ID: <b>2-24-26</b>	Sampled: 11/14/11 11:30
Lab Sample ID: <b>1111290-14</b>	Sampled By: KSJ
Matrix: Water	Received: 11/15/11 09:00
Unit: ug/L	Prepared: 11/21/11 By: DLV
Dilution Factor: 1	Analyzed: 11/22/11 By: DLV
QC Batch: 1113349	Analytical Batch: 1K22022

### Volatile Organic Compounds by EPA Method 8260B

CAS Number	Analyte	Analytical Result		RL
79-01-6	Trichloroethene	7.7		1.0
Surrogates:		% Recovery	Control Limits	
	Dibromofluoromethane	109	88-116	
	1,2-Dichloroethane-d4	102	87-123	
	Toluene-d8	98	91-107	
	4-Bromofluorobenzene	94	84-106	

## ANALYTICAL REPORT

Client:	<b>Barr Engineering Company</b>	Work Order:	<b>1111290</b>
Project:	23/27-169407:General Mills MN Cert. #026-999	Description:	Laboratory Services
Client Sample ID:	<b>112-15.8-16.8</b>	Sampled:	11/14/11 11:55
Lab Sample ID:	<b>1111290-15</b>	Sampled By:	KSJ
Matrix:	Water	Received:	11/15/11 09:00
Unit:	ug/L	Prepared:	11/21/11 By: DLV
Dilution Factor:	1	Analyzed:	11/22/11 By: DLV
QC Batch:	1113349	Analytical Batch:	1K22022

### Volatile Organic Compounds by EPA Method 8260B

CAS Number	Analyte	Analytical Result		RL
79-01-6	Trichloroethene	8.0		1.0
<i>Surrogates:</i>		<i>% Recovery</i>	<i>Control Limits</i>	
	<i>Dibromofluoromethane</i>	108	88-116	
	<i>1,2-Dichloroethane-d4</i>	102	87-123	
	<i>Toluene-d8</i>	99	91-107	
	<i>4-Bromofluorobenzene</i>	95	84-106	

## ANALYTICAL REPORT

Client: <b>Barr Engineering Company</b>	Work Order: <b>1111290</b>
Project: 23/27-169407:General Mills MN Cert. #026-999	Description: Laboratory Services
Client Sample ID: <b>112-16.8-17.8</b>	Sampled: 11/14/11 12:00
Lab Sample ID: <b>1111290-16</b>	Sampled By: KSJ
Matrix: Water	Received: 11/15/11 09:00
Unit: ug/L	Prepared: 11/21/11 By: DLV
Dilution Factor: 1	Analyzed: 11/22/11 By: DLV
QC Batch: 1113349	Analytical Batch: 1K22022

### Volatile Organic Compounds by EPA Method 8260B

CAS Number	Analyte	Analytical Result		RL
79-01-6	Trichloroethene	8.8		1.0
<i>Surrogates:</i>		<i>% Recovery</i>	<i>Control Limits</i>	
	<i>Dibromofluoromethane</i>	108	88-116	
	<i>1,2-Dichloroethane-d4</i>	100	87-123	
	<i>Toluene-d8</i>	99	91-107	
	<i>4-Bromofluorobenzene</i>	94	84-106	

## ANALYTICAL REPORT

Client: <b>Barr Engineering Company</b>	Work Order: <b>1111290</b>
Project: 23/27-169407:General Mills MN Cert. #026-999	Description: Laboratory Services
Client Sample ID: <b>112-20.8-22.8</b>	Sampled: 11/14/11 12:05
Lab Sample ID: <b>1111290-17</b>	Sampled By: KSJ
Matrix: Water	Received: 11/15/11 09:00
Unit: ug/L	Prepared: 11/21/11 By: DLV
Dilution Factor: 1	Analyzed: 11/22/11 By: DLV
QC Batch: 1113349	Analytical Batch: 1K22022

### Volatile Organic Compounds by EPA Method 8260B

CAS Number	Analyte	Analytical Result		RL
79-01-6	Trichloroethene	10		1.0
<i>Surrogates:</i>		<i>% Recovery</i>	<i>Control Limits</i>	
	<i>Dibromofluoromethane</i>	108	88-116	
	<i>1,2-Dichloroethane-d4</i>	101	87-123	
	<i>Toluene-d8</i>	99	91-107	
	<i>4-Bromofluorobenzene</i>	92	84-106	

## ANALYTICAL REPORT

Client: <b>Barr Engineering Company</b>	Work Order: <b>1111290</b>
Project: 23/27-169407:General Mills MN Cert. #026-999	Description: Laboratory Services
Client Sample ID: <b>112-27.8-29.8</b>	Sampled: 11/14/11 12:10
Lab Sample ID: <b>1111290-18</b>	Sampled By: KSJ
Matrix: Water	Received: 11/15/11 09:00
Unit: ug/L	Prepared: 11/21/11 By: DLV
Dilution Factor: 1	Analyzed: 11/22/11 By: DLV
QC Batch: 1113349	Analytical Batch: 1K22022

### Volatile Organic Compounds by EPA Method 8260B

CAS Number	Analyte	Analytical Result		RL
79-01-6	Trichloroethene	6.8		1.0
<i>Surrogates:</i>		<i>% Recovery</i>	<i>Control Limits</i>	
	<i>Dibromofluoromethane</i>	109	88-116	
	<i>1,2-Dichloroethane-d4</i>	101	87-123	
	<i>Toluene-d8</i>	99	91-107	
	<i>4-Bromofluorobenzene</i>	94	84-106	

## ANALYTICAL REPORT

Client: <b>Barr Engineering Company</b>	Work Order: <b>1111290</b>
Project: 23/27-169407:General Mills MN Cert. #026-999	Description: Laboratory Services
Client Sample ID: <b>112-33.8-35.8</b>	Sampled: 11/14/11 12:15
Lab Sample ID: <b>1111290-19</b>	Sampled By: KSJ
Matrix: Water	Received: 11/15/11 09:00
Unit: ug/L	Prepared: 11/21/11 By: DLV
Dilution Factor: 1	Analyzed: 11/22/11 By: DLV
QC Batch: 1113349	Analytical Batch: 1K22022

### Volatile Organic Compounds by EPA Method 8260B

CAS Number	Analyte	Analytical Result	RL
79-01-6	Trichloroethene	7.8	1.0
<b>Surrogates:</b>			
		<b>% Recovery</b>	<b>Control Limits</b>
	Dibromofluoromethane	108	88-116
	1,2-Dichloroethane-d4	101	87-123
	Toluene-d8	99	91-107
	4-Bromofluorobenzene	93	84-106

## ANALYTICAL REPORT

Client:	Barr Engineering Company	Work Order:	1111290
Project:	23/27-169407:General Mills MN Cert. #026-999	Description:	Laboratory Services
Client Sample ID:	M-1	Sampled:	11/14/11 00:00
Lab Sample ID:	1111290-20	Sampled By:	KSJ
Matrix:	Water	Received:	11/15/11 09:00
Unit:	ug/L	Prepared:	11/21/11 By: DLV
Dilution Factor:	1	Analyzed:	11/22/11 By: DLV
QC Batch:	1113349	Analytical Batch:	1K22022

### Volatile Organic Compounds by EPA Method 8260B

CAS Number	Analyte	Analytical Result		RL
79-01-6	Trichloroethene	6.3		1.0
<b>Surrogates:</b>		<b>% Recovery</b>	<b>Control Limits</b>	
	Dibromofluoromethane	108	88-116	
	1,2-Dichloroethane-d4	102	87-123	
	Toluene-d8	100	91-107	
	4-Bromofluorobenzene	95	84-106	

## ANALYTICAL REPORT

Client: <b>Barr Engineering Company</b>	Work Order: <b>1111290</b>
Project: 23/27-169407:General Mills MN Cert. #026-999	Description: Laboratory Services
Client Sample ID: <b>FB-1</b>	Sampled: 11/14/11 12:30
Lab Sample ID: <b>1111290-21</b>	Sampled By: KSJ
Matrix: Water	Received: 11/15/11 09:00
Unit: ug/L	Prepared: 11/21/11 By: DLV
Dilution Factor: 1	Analyzed: 11/21/11 By: DLV
QC Batch: 1113347	Analytical Batch: 1K22021

### Volatile Organic Compounds by EPA Method 8260B

CAS Number	Analyte	Analytical Result		RL
79-01-6	Trichloroethene	<1.0		1.0
<b>Surrogates:</b>		<b>% Recovery</b>	<b>Control Limits</b>	
	<i>Dibromofluoromethane</i>	109	88-116	
	<i>1,2-Dichloroethane-d4</i>	102	87-123	
	<i>Toluene-d8</i>	99	91-107	
	<i>4-Bromofluorobenzene</i>	96	84-106	

## ANALYTICAL REPORT

Client:	Barr Engineering Company	Work Order:	1111290
Project:	23/27-169407:General Mills MN Cert. #026-999	Description:	Laboratory Services
Client Sample ID:	TB	Sampled:	11/14/11 00:00
Lab Sample ID:	1111290-22	Sampled By:	KSJ
Matrix:	Water	Received:	11/15/11 09:00
Unit:	ug/L	Prepared:	11/21/11 By: DLV
Dilution Factor:	1	Analyzed:	11/21/11 By: DLV
QC Batch:	1113347	Analytical Batch:	1K22021

### Volatile Organic Compounds by EPA Method 8260B

CAS Number	Analyte	Analytical Result		RL
79-01-6	Trichloroethene	<1.0		1.0
<i>Surrogates:</i>		<i>% Recovery</i>	<i>Control Limits</i>	
	<i>Dibromofluoromethane</i>	109	88-116	
	<i>1,2-Dichloroethane-d4</i>	102	87-123	
	<i>Toluene-d8</i>	98	91-107	
	<i>4-Bromofluorobenzene</i>	95	84-106	

## QUALITY CONTROL REPORT

### Volatile Organic Compounds by EPA Method 8260B

Analyte	Sample Conc.	Spike Qty.	Result	Spike % Rec.	Control Limits	RPD	RPD Limits	RL
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**QC Batch: 1113347** 5030B Aqueous Purge & Trap/USEPA-8260B

<b>Method Blank</b>					Analyzed:		11/21/2011	By: DLV
Unit: ug/L					Analytical Batch:		1K22021	
Trichloroethene			<1.0				1.0	
<b>Surrogates:</b>								
Dibromofluoromethane				106	88-116			
1,2-Dichloroethane-d4				101	87-123			
Toluene-d8				98	91-107			
4-Bromofluorobenzene				97	84-106			

<b>Laboratory Control Sample</b>					Analyzed:		11/21/2011	By: DLV
Unit: ug/L					Analytical Batch:		1K22021	
Trichloroethene	40.0	<b>40.6</b>		101	82-119	--	20	1.0
<b>Surrogates:</b>								
Dibromofluoromethane				103	88-116			
1,2-Dichloroethane-d4				98	87-123			
Toluene-d8				102	91-107			
4-Bromofluorobenzene				100	84-106			

<b>Laboratory Control Sample Duplicate</b>					Analyzed:		11/21/2011	By: DLV
Unit: ug/L					Analytical Batch:		1K22021	
Trichloroethene	40.0	<b>42.8</b>		107	82-119	5	20	1.0
<b>Surrogates:</b>								
Dibromofluoromethane				103	88-116			
1,2-Dichloroethane-d4				98	87-123			
Toluene-d8				100	91-107			
4-Bromofluorobenzene				101	84-106			

**QC Batch: 1113349** 5030B Aqueous Purge & Trap/USEPA-8260B

<b>Method Blank</b>					Analyzed:		11/21/2011	By: DLV
Unit: ug/L					Analytical Batch:		1K22022	
Trichloroethene			<1.0				1.0	
<b>Surrogates:</b>								
Dibromofluoromethane				107	88-116			
1,2-Dichloroethane-d4				101	87-123			
Toluene-d8				99	91-107			
4-Bromofluorobenzene				95	84-106			

<b>Laboratory Control Sample</b>					Analyzed:		11/21/2011	By: DLV
Unit: ug/L					Analytical Batch:		1K22022	
Trichloroethene	40.0	<b>43.6</b>		109	82-119	--	20	1.0

Continued on next page

## QUALITY CONTROL REPORT

### Volatile Organic Compounds by EPA Method 8260B (Continued)

Analyte	Sample Conc.	Spike Qty.	Result	Spike % Rec.	Control Limits	RPD	RPD Limits	RL
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**QC Batch: 1113349 (Continued)** 5030B Aqueous Purge & Trap/USEPA-8260B

**Laboratory Control Sample (Continued)**

Unit: ug/L

Analyzed: 11/21/2011 By: DLV

Analytical Batch: 1K22022

**Surrogates:**

<i>Dibromofluoromethane</i>	105	88-116
<i>1,2-Dichloroethane-d4</i>	100	87-123
<i>Toluene-d8</i>	102	91-107
<i>4-Bromofluorobenzene</i>	101	84-106

**Laboratory Control Sample Duplicate**

Unit: ug/L

Analyzed: 11/21/2011 By: DLV

Analytical Batch: 1K22022

Trichloroethene	40.0	<b>43.2</b>	108	82-119	0.9	20	1.0
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**Surrogates:**

<i>Dibromofluoromethane</i>	104	88-116
<i>1,2-Dichloroethane-d4</i>	98	87-123
<i>Toluene-d8</i>	102	91-107
<i>4-Bromofluorobenzene</i>	100	84-106

## STATEMENT OF DATA QUALIFICATIONS

All analyses have been validated and comply with our Quality Control Program.  
No Qualifications required.

11/12/20 JLR  
 Rack #12W : 1029W 13-15

Project Number: 23/27-0169 Y10203

Project Name: General Mills

Sample Origination State MN (use two letter postal state abbreviation)

COC Number: **No 37090**

Location	Start Depth	Stop Depth	Depth Unit (m./ft. or in.)	Collection Date (mm/dd/yyyy)	Collection Time (hh:mm)	Matrix		Type	
						Water	Soil	Grab	Comp.
1. T-16-18	—	—		11/14/2011	0940	✓		✓	
2. S-17-18	—	—			0940	✓		✓	
3. S-18-19	—	—			0945	✓		✓	
4. S-24-26	—	—			0950	✓		✓	
5. V-19.5-20.5	—	—			1005	✓		✓	
6. V-20.5-21.5	—	—			1010	✓		✓	
7. V-22-24	—	—			1015	✓		✓	
8. V-25-27	—	—			1020	✓		✓	
9. W-12-13	—	—			1040	✓		✓	
10. W-13-14	—	—			1045	✓		✓	

Number of Containers/Preservative														COC 1 of 2	
Water							Soil							Total Number Of Containers	
VOCs (HCl) #1	SVOs (unpreserved) #2	Dissolved Metals (HNO <sub>3</sub> )	Total Metals (HNO <sub>3</sub> )	General (unpreserved) #3	Diesel Range Organics (HCl)	Nutrients (H <sub>2</sub> SO <sub>4</sub> ) #4	VOCs (tared MeOH) #1	GRO, BTEX (tared MeOH) #1	DRO (tared unpreserved)	Metals (unpreserved)	SVOs (unpreserved) #2	% Solids (plastic vial, unpres.)			
														2	TCE
														2	
														2	
														2	
														2	
														2	
														2	
														2	
														2	

Project Manager: Sara Ramsden  
 Project QC Contact: MDD  
 Sampled by: KSJ  
 Laboratory: TRI-MATRIX

**Common Parameter/Container - Preservation Key**

- #1 - Volatile Organics = BTEX, GRO, TPH, 8260 Full List
- #2 - Semivolatile Organics = PAHs, PCP, Dioxins, 8270 Full List, Herbicide/Pesticide/PCBs
- #3 - General = pH, Chloride, Fluoride, Alkalinity, TSS, TDS, TS, Sulfate
- #4 - Nutrients = COD, TOC, Phenols, Ammonia Nitrogen, TKN

Relinquished By: <u>[Signature]</u>	On Ice? <u>Y</u>	Date: <u>11/14/2011</u>	Time: <u></u>	Received by: <u>[Signature]</u>	Date: <u>11-15-11</u>	Time: <u>0900</u>
Relinquished By: <u>[Signature]</u>	On Ice? <u>Y</u>	Date: <u></u>	Time: <u></u>	Received by: <u>W. Cole</u>	Date: <u>11-15-11</u>	Time: <u>0900</u>
Samples Shipped VIA: <input type="checkbox"/> Air Freight <input checked="" type="checkbox"/> Federal Express <input type="checkbox"/> Sampler				Air Bill Number: <u>8586 7450 3590</u>		

Distribution: White-Original Accompanies Shipment to Lab; Yellow - Field Copy; Pink - Lab Coordinator



III 290 JLR  
Back #12W & 1029W

13.15

Project Number: 23/27-0169 Y10 203

Project Name: General Mills

Sample Origination State MN (use two letter postal state abbreviation)

COC Number: No 37091

Location	Start Depth	Stop Depth	Depth Unit (m./ft. or in.)	Collection Date (mm/dd/yyyy)	Collection Time (hh:mm)	Matrix		Type	
						Water	Soil	Grab Comp.	OC
1. W-16.5-18.5				11/14/2011	1050	✓		✓	
2. 2-20-21					1120	✓		✓	
3. 2-21-22					1125	✓		✓	
4. 2-24-26					1130	✓		✓	
5. 112-15.8-16.8					1155	✓		✓	
6. 112-16.8-17.8					1200	✓		✓	
7. 112-20.8-22.8					1205	✓		✓	
8. 112-27.8-29.8					1210	✓		✓	
9. 112-33.8-35.8					1215	✓		✓	
10. M-1 / FB-1 TB					FB-1230			✓	✓

[illegible]

### Common Parameter/Container - Preservation Key

#1 - Volatile Organics = BTEX, GRQ, TPH, 8260 Full List

#2 - Semivolatile Organics = PAHs, PCP, Dioxins, 8270  
Full List, Herbicide/Pesticide/PCBs

#3 - General = pH, Chloride, Fluoride, Alkalinity, TSS, TDS, TS, Sulfate

#4 - Nutrients = COD, TOC, Phenols, Ammonia Nitrogen, TKN

Relinquished By: <i>R. M. Hammen</i>	On Ice? Y N	Date <i>11/14/2011</i>	Time
Relinquished By:	On Ice? Y N	Date	Time

Samples Shipped VIA: ☐ Air Freight ☒ Federal Express ☐ Sampler  
☐ Other: \_\_\_\_\_

Received by:	Date	Time
Received by: <i>W. Cole</i>	Date <i>11-15-11</i>	Time <i>9am</i>

Air Bill Number: 8586 4450 3590

Distribution: White-Original Accompanies Shipment to Lab; Yellow - Field Copy; Pink - Lab Coordinator

# SAMPLE RECEIVING / LOG-IN CHECKLIST



Client <b>Barr</b>	Work Order #: <b>1111290</b>
Receipt Record Page/Line # <b>13.15</b>	New / Add To <b>JKR</b>
	Sample #s

Recorded by (Initials/date) <b>WC 11.15.11</b>	<input checked="" type="checkbox"/> Cooler <input type="checkbox"/> Box <input type="checkbox"/> Other	Qty Received <b>1</b>	<input checked="" type="checkbox"/> IR Gun (#202) <input type="checkbox"/> Digital Thermometer (#54) <input type="checkbox"/> Other (#)	<input type="checkbox"/> See Additional Cooler Information Form
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Cooler #	Time	Cooler #	Time	Cooler #	Time	Cooler #	Time
<b>Im 2740</b>	<b>1220</b>						
Custody Seals: <input type="checkbox"/> None <input type="checkbox"/> Present / Intact <input type="checkbox"/> Present / Not Intact		Custody Seals: <input type="checkbox"/> None <input type="checkbox"/> Present / Intact <input type="checkbox"/> Present / Not Intact		Custody Seals: <input type="checkbox"/> None <input type="checkbox"/> Present / Intact <input type="checkbox"/> Present / Not Intact		Custody Seals: <input type="checkbox"/> None <input type="checkbox"/> Present / Intact <input type="checkbox"/> Present / Not Intact	
Coolant Location: Dispersed / Top / Middle / Bottom		Coolant Location: Dispersed / Top / Middle / Bottom		Coolant Location: Dispersed / Top / Middle / Bottom		Coolant Location: Dispersed / Top / Middle / Bottom	
Coolant/Temperature Taken Via: <input type="checkbox"/> Loose Ice / Avg 2-3 containers <input type="checkbox"/> Bagged Ice / Avg 2-3 containers <input type="checkbox"/> Blue Ice / Avg 2-3 containers <input checked="" type="checkbox"/> None / Avg 2-3 containers		Coolant/Temperature Taken Via: <input type="checkbox"/> Loose Ice / Avg 2-3 containers <input type="checkbox"/> Bagged Ice / Avg 2-3 containers <input type="checkbox"/> Blue Ice / Avg 2-3 containers <input checked="" type="checkbox"/> None / Avg 2-3 containers		Coolant/Temperature Taken Via: <input type="checkbox"/> Loose Ice / Avg 2-3 containers <input type="checkbox"/> Bagged Ice / Avg 2-3 containers <input type="checkbox"/> Blue Ice / Avg 2-3 containers <input checked="" type="checkbox"/> None / Avg 2-3 containers		Coolant/Temperature Taken Via: <input type="checkbox"/> Loose Ice / Avg 2-3 containers <input type="checkbox"/> Bagged Ice / Avg 2-3 containers <input type="checkbox"/> Blue Ice / Avg 2-3 containers <input checked="" type="checkbox"/> None / Avg 2-3 containers	
Alternate Temperature Taken Via: <input checked="" type="checkbox"/> Temperature Blank (TB) <input type="checkbox"/> 1 Container		Alternate Temperature Taken Via: <input type="checkbox"/> Temperature Blank (TB) <input type="checkbox"/> 1 Container		Alternate Temperature Taken Via: <input type="checkbox"/> Temperature Blank (TB) <input type="checkbox"/> 1 Container		Alternate Temperature Taken Via: <input type="checkbox"/> Temperature Blank (TB) <input type="checkbox"/> 1 Container	
Recorded °C	Correction Factor °C	Actual °C	Recorded °C	Correction Factor °C	Actual °C	Recorded °C	Correction Factor °C
Temp Blank: -		<b>7.2</b>	Temp Blank:			Temp Blank:	
TB location: Representative / Not Representative		TB location: Representative / Not Representative		TB location: Representative / Not Representative		TB location: Representative / Not Representative	
1			1			1	
2			2			2	
3			3			3	
Average °C		Average °C		Average °C		Average °C	
<input type="checkbox"/> Cooler ID on COC? <input checked="" type="checkbox"/> VOC Trip Blank received? <b>(2)</b>		<input type="checkbox"/> Cooler ID on COC? <input type="checkbox"/> VOC Trip Blank received?		<input type="checkbox"/> Cooler ID on COC? <input type="checkbox"/> VOC Trip Blank received?		<input type="checkbox"/> Cooler ID on COC? <input type="checkbox"/> VOC Trip Blank received?	

If any shaded areas checked, complete Sample Receiving Non-Conformance Form

<b>Paperwork Received</b> N/A Yes No <input checked="" type="checkbox"/> Chain of Custody record(s)? If No, COC Initiated By _____ Rec'd for Lab Signed/Date/Time? Shipping document? Other _____		<input type="checkbox"/> No COC Received
COCID #s <input type="checkbox"/> TriMatrix <input checked="" type="checkbox"/> Other (Name or ID#) <b>Barr 37090, 37091</b>		
<b>Check COC for Accuracy</b> Yes No <input checked="" type="checkbox"/> Sample ID matches COC? <input checked="" type="checkbox"/> Sample Date and Time matches COC? <input checked="" type="checkbox"/> Container type completed on COC? <input checked="" type="checkbox"/> All container types indicated are received?		<input type="checkbox"/> No analysis requested
<b>Sample Condition Summary</b> N/A Yes No <input checked="" type="checkbox"/> Broken containers/lids? <input checked="" type="checkbox"/> Missing or incomplete labels? <input checked="" type="checkbox"/> Illegible information on labels? <input checked="" type="checkbox"/> Low volume received? <input checked="" type="checkbox"/> Inappropriate containers received? <input checked="" type="checkbox"/> VOC vials / TOX containers have headspace? <input checked="" type="checkbox"/> Extra sample locations / containers not listed on COC?		<input type="checkbox"/> Non-TriMatrix containers, see Notes

<b>Check Sample Preservation</b> N/A Yes No <input checked="" type="checkbox"/> Average sample temperature ≤6° C? <input checked="" type="checkbox"/> Completed Sample Preservation Verification Form? <input checked="" type="checkbox"/> Samples preserved correctly? If "No", added orange tag? Received pre-preserved VOC soils? <input type="checkbox"/> MeOH <input type="checkbox"/> Na <sub>2</sub> SO <sub>4</sub>	
<b>Check for Short Hold-Time Prep/Analyses</b> <input type="checkbox"/> Bacteriological <input type="checkbox"/> Air Bags <input type="checkbox"/> EnCores / Methanol Pre-Preserved <input type="checkbox"/> Formaldehyde/Aldehyde <input type="checkbox"/> Green-tagged containers <input type="checkbox"/> Yellow/White-tagged 1L ambers (SV Prep-Lab)	
<b>Notes</b> <input checked="" type="checkbox"/> Trip Blank received <b>(2)</b> <input type="checkbox"/> Trip Blank not listed on COC <input type="checkbox"/> No COC received, Proj. Chemist reviewed (Init/Date) _____ <input type="checkbox"/> No analysis requested, Proj. Chemist completed (Init/Date) _____	
Cooler Received (Date/Time) <b>10 11.15.11 0900</b>	Paperwork Delivered (Date/Time) <b>11.15.11 1235</b>
≤1 Hour Goal Met? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	

## LABORATORY REPORT

November 30, 2011

Michael Dupay  
Barr Engineering  
4700 West 77th Street  
Minneapolis, MN 55435

### **RE: East Hennepin Ave. Site / 23127-0169-Y10-204**

Dear Michael:

Enclosed are the results of the samples submitted to our laboratory on November 21, 2011. For your reference, these analyses have been assigned our service request number P1104547.

All analyses were performed according to our laboratory's NELAP and DoD-ELAP-approved quality assurance program. The test results meet requirements of the current NELAP and DoD-ELAP standards, where applicable, and except as noted in the laboratory case narrative provided. For a specific list of NELAP and DoD-ELAP-accredited analytes, refer to the certifications section at [www.caslab.com](http://www.caslab.com). Results are intended to be considered in their entirety and apply only to the samples analyzed and reported herein.

Columbia Analytical Services, Inc. is certified by the California Department of Health Services, NELAP Laboratory Certificate No. 02115CA; Arizona Department of Health Services, Certificate No. AZ0694; Florida Department of Health, NELAP Certification E871020; New Jersey Department of Environmental Protection, NELAP Laboratory Certification ID #CA009; New York State Department of Health, NELAP NY Lab ID No: 11221; Oregon Environmental Laboratory Accreditation Program, NELAP ID: CA20007; The American Industrial Hygiene Association, Laboratory #101661; United States Department of Defense Environmental Laboratory Accreditation Program (DoD-ELAP), Certificate No. L10-3-R2; Pennsylvania Registration No. 68-03307; TX Commission of Environmental Quality, NELAP ID T104704413-11-2; Minnesota Department of Health, NELAP Certificate No. 219474; Washington State Department of Ecology, ELAP Lab ID: C946. Each of the certifications listed above have an explicit Scope of Accreditation that applies to specific matrices/methods/analytes; therefore, please contact me for information corresponding to a particular certification.

If you have any questions, please call me at (805) 526-7161.

Respectfully submitted,

**Columbia Analytical Services, Inc.**



Digitally signed by Kelly  
Horiuchi  
Date: 2011.11.30 13:23:49 -08'00'

Kelly Horiuchi  
Laboratory Director

Client: Barr Engineering  
Project: East Hennepin Ave. Site / 23127-0169-Y10-204

CAS Project No: P1104547

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## CASE NARRATIVE

The samples were received intact under chain of custody on November 21, 2011 and were stored in accordance with the analytical method requirements. Please refer to the sample acceptance check form for additional information. The results reported herein are applicable only to the condition of the samples at the time of sample receipt.

### Trichloroethene Analysis

The samples were analyzed for trichloroethene in accordance with EPA Method TO-15 from the Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air, Second Edition (EPA/625/R-96/010b), January, 1999. The analytical system was comprised of a gas chromatograph / mass spectrometer (GC/MS) interfaced to a whole-air preconcentrator.

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*The results of analyses are given in the attached laboratory report. All results are intended to be considered in their entirety, and Columbia Analytical Services, Inc. (CAS) is not responsible for utilization of less than the complete report.*

*Use of Columbia Analytical Services, Inc. (CAS) Name. Client shall not use CAS's name or trademark in any marketing or reporting materials, press releases or in any other manner ("Materials") whatsoever and shall not attribute to CAS any test result, tolerance or specification derived from CAS's data ("Attribution") without CAS's prior written consent, which may be withheld by CAS for any reason in its sole discretion. To request CAS's consent, Client shall provide copies of the proposed Materials or Attribution and describe in writing Client's proposed use of such Materials or Attribution. If CAS has not provided written approval of the Materials or Attribution within ten (10) days of receipt from Client, Client's request to use CAS's name or trademark in any Materials or Attribution shall be deemed denied. CAS may, in its discretion, reasonably charge Client for its time in reviewing Materials or Attribution requests. Client acknowledges and agrees that the unauthorized use of CAS's name or trademark may cause CAS to incur irreparable harm for which the recovery of money damages will be inadequate. Accordingly, Client acknowledges and agrees that a violation shall justify preliminary injunctive relief. For questions contact the laboratory.*

# DETAIL SUMMARY REPORT

Client: Barr Engineering  
Project ID: East Hennepin Ave. Site / 23127-0169-Y10-204

Service Request: P1104547

Date Received: 11/21/2011  
Time Received: 09:40

TO-15 - VOC Cans

Client Sample ID	Lab Code	Matrix	Date Collected	Time Collected	Container ID	Pi1 (psig)	Pf1 (psig)	
W	P1104547-001	Air	11/18/2011	09:55	SC01059	-1.78	3.64	X
V	P1104547-002	Air	11/18/2011	10:40	SC00194	-1.60	3.51	X
S	P1104547-003	Air	11/18/2011	11:15	SC00121	-1.65	3.69	X
T	P1104547-004	Air	11/18/2011	11:50	SC01027	-2.40	3.55	X
2	P1104547-005	Air	11/18/2011	12:50	SC00592	-1.94	3.64	X



### Sample Acceptance Check Form

Client: Barr Engineering Work order: P1104547

Project: East Hennepin Ave. Site / 23127-0169-Y10-204

Sample(s) received on: 11/21/11 Date opened: 11/21/11 by: MZAMORA

**Note:** This form is used for all samples received by CAS. The use of this form for custody seals is strictly meant to indicate presence/absence and not as an indication of compliance or nonconformity. Thermal preservation and pH will only be evaluated either at the request of the client and/or as required by the method/SOP.

	Yes	No	N/A
1 Were <b>sample containers</b> properly marked with client sample ID?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2 Container(s) <b>supplied by CAS</b> ?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3 Did <b>sample containers</b> arrive in good condition?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4 Were <b>chain-of-custody</b> papers used and filled out?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5 Did <b>sample container labels</b> and/or tags agree with custody papers?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6 Was <b>sample volume</b> received adequate for analysis?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7 Are samples within specified holding times?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8 Was proper <b>temperature</b> (thermal preservation) of cooler at receipt adhered to?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
9 Was a <b>trip blank</b> received?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
10 Were <b>custody seals</b> on outside of cooler/Box?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Location of seal(s)? _____ Sealing Lid?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Were signature and date included?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Were seals intact?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Were custody seals on outside of sample container?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Location of seal(s)? _____ Sealing Lid?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Were signature and date included?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Were seals intact?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
11 Do containers have appropriate <b>preservation</b> , according to method/SOP or Client specified information?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Is there a client indication that the submitted samples are <b>pH</b> preserved?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Were <b>VOA vials</b> checked for presence/absence of air bubbles?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Does the client/method/SOP require that the analyst check the sample pH and <u>if necessary</u> alter it?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
12 <b>Tubes:</b> Are the tubes capped and intact?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Do they contain moisture?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
13 <b>Badges:</b> Are the badges properly capped and intact?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Are dual bed badges separated and individually capped and intact?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Lab Sample ID	Container Description	Required pH *	Received pH	Adjusted pH	VOA Headspace (Presence/Absence)	Receipt / Preservation Comments
P1104547-001.01	6.0 L Source Can					
P1104547-002.01	6.0 L Source Can					
P1104547-003.01	6.0 L Source Can					
P1104547-004.01	6.0 L Source Can					
P1104547-005.01	6.0 L Source Can					

Explain any discrepancies: (include lab sample ID numbers): \_\_\_\_\_

# RESULTS OF ANALYSIS

Page 1 of 1

**Client:** Barr Engineering

**Client Project ID:** East Hennepin Ave. Site / 23127-0169-Y10-204

**CAS Project ID:** P1104547

## Trichloroethene

**Test Code:** EPA TO-15

**Instrument ID:** Tekmar AUTOCAN/Agilent 5973inert/6890N/MS8

**Analyst:** Elsa Moctezuma

**Sampling Media:** 6.0 L Summa Canister(s)

**Test Notes:**
**Date(s) Collected:** 11/18/11

**Date Received:** 11/21/11

**Date Analyzed:** 11/28/11

Client Sample ID	CAS Sample ID	Injection	Canister	Result	MRL	Result	MRL	Data
		Volume	Dilution					
		Liter(s)	Factor	µg/m <sup>3</sup>	µg/m <sup>3</sup>	ppbV	ppbV	Qualifier
W	P1104547-001	1.00	1.42	0.80	0.71	0.15	0.13	
V	P1104547-002	1.00	1.39	110	0.70	20	0.13	
S	P1104547-003	0.040	1.41	2,600	18	480	3.3	
T	P1104547-004	1.00	1.48	1.5	0.74	0.28	0.14	
2	P1104547-005	0.12	1.44	810	6.0	150	1.1	
Method Blank	P111128-MB	1.00	1.00	ND	0.50	ND	0.093	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

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SURROGATE SPIKE RECOVERY RESULTS

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Page 1 of 1

**Client:** Barr Engineering  
**Client Project ID:** East Hennepin Ave. Site / 23127-0169-Y10-204

CAS Project ID: P1104547

**Test Code:** EPA TO-15  
**Instrument ID:** Tekmar AUTOCAN/Agilent 5973inert/6890N/MS8  
**Analyst:** Elsa Moctezuma  
**Sampling Media:** 6.0 L Summa Canister(s)  
**Test Notes:**

Date(s) Collected: 11/18/11

Date(s) Received: 11/21/11

Date(s) Analyzed: 11/28/11

Client Sample ID	CAS Sample ID	1,2-Dichloroethane-d4	Toluene-d8	Bromofluorobenzene	Acceptance Limits	Data Qualifier
		Percent Recovered	Percent Recovered	Percent Recovered		
Method Blank	P111128-MB	102	97	97	70-130	
Lab Control Sample	P111128-LCS	101	99	93	70-130	
W	P1104547-001	101	100	95	70-130	
V	P1104547-002	100	98	97	70-130	
S	P1104547-003	104	99	95	70-130	
S	P1104547-003DUP	104	97	99	70-130	
T	P1104547-004	101	97	97	70-130	
2	P1104547-005	103	98	97	70-130	

Surrogate percent recovery is verified and accepted based on the on-column result.

Reported results are shown in concentration units and as a result of the calculation, may vary slightly from the on-column percent recovery.

## LABORATORY CONTROL SAMPLE SUMMARY

Page 1 of 1

<b>Client:</b>	<b>Barr Engineering</b>	
<b>Client Sample ID:</b>	<b>Lab Control Sample</b>	CAS Project ID: P1104547
<b>Client Project ID:</b>	<b>East Hennepin Ave. Site / 23127-0169-Y10-204</b>	CAS Sample ID: P111128-LCS
<b>Test Code:</b>	EPA TO-15	Date Collected: NA
<b>Instrument ID:</b>	Tekmar AUTOCAN/Agilent 5973inert/6890N/MS8	Date Received: NA
<b>Analyst:</b>	Elsa Moctezuma	Date Analyzed: 11/28/11
<b>Sampling Media:</b>	6.0 L Summa Canister	Volume(s) Analyzed: 0.125 Liter(s)
<b>Test Notes:</b>		

CAS #	Compound	Spike Amount µg/m <sup>3</sup>	Result µg/m <sup>3</sup>	% Recovery	CAS Acceptance Limits	Data Qualifier
79-01-6	Trichloroethene	194	181	93	65-109	

Laboratory Control Sample percent recovery is verified and accepted based on the on-column result.  
Reported results are shown in concentration units and as a result of the calculation, may vary slightly.

## LABORATORY DUPLICATE SUMMARY RESULTS

Page 1 of 1

**Client:** Barr Engineering

**Client Sample ID:** S

**Client Project ID:** East Hennepin Ave. Site / 23127-0169-Y10-204

CAS Project ID: P1104547

CAS Sample ID: P1104547-003DUP

**Test Code:** EPA TO-15

**Date Collected:** 11/18/11

**Instrument ID:** Tekmar AUTOCAN/Agilent 5973inert/6890N/MS8

**Date Received:** 11/21/11

**Analyst:** Elsa Moctezuma

**Date Analyzed:** 11/28/11

**Sampling Media:** 6.0 L Summa Canister

**Volume(s) Analyzed:** 0.040 Liter(s)

**Test Notes:**
**Container ID:** SC00121

**Initial Pressure (psig):** -1.65

**Final Pressure (psig):** 3.69

**Canister Dilution Factor:** 1.41

Compound	Sample Result		Duplicate Sample Result		Average µg/m <sup>3</sup>	% RPD	RPD Limit	Data Qualifier
	µg/m <sup>3</sup>	ppbV	µg/m <sup>3</sup>	ppbV				
Trichloroethene	2,560	477	2,570	479	2565	0.4	25	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

January 17, 2012

Barr Engineering Company  
Attn: Michael Dupay  
4700 West 77th Street  
Minneapolis, MN 55435

**Project: 23/27-169407:General Mills MN Cert. #026-999-161**

Dear Michael Dupay,

Enclosed is a copy of the laboratory report for the following work order(s) received by TriMatrix Laboratories:

<b>Work Order</b>	<b>Received</b>	<b>Description</b>
1201170	01/14/2012	Laboratory Services

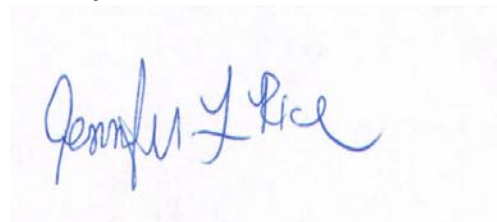
This report relates only to the sample(s) as received. Test results are in compliance with the requirements of the National Environmental Laboratory Accreditation Program (NELAP) and/or one of the following certification programs:

ACLASS DoD-ELAP (#ADE-1542); Arkansas DEP (#10-046-0); Florida DEP (#E87622-05); Georgia EPD (#E87622-05); Illinois DEP (#002656); Kansas DPH (#E-10302); Kentucky DEP (#0021); Louisiana DEP (#03068); Michigan DPH (#0034); Minnesota DPH (#026-999-161); New York ELAP (#44950); North Carolina DNRE (#659); Rhode Island DPH (#E87622); Texas CEQ (#T104704495-11-1); Virginia DCLS (#919); Wisconsin DNR (#999472650).

Any qualification or narration of results, including sample acceptance requirements and test exceptions to the above referenced programs, is presented in the Statement of Data Qualifications section of this report. Estimates of analytical uncertainties and certification documents for the test results contained within this report are available upon request.

If you have any questions or require further information, please do not hesitate to contact me.

Sincerely,



Jennifer L. Rice  
Project Chemist

## ANALYTICAL REPORT

Client: <b>Barr Engineering Company</b>	Work Order: <b>1201170</b>
Project: 23/27-169407:General Mills MN Cert. #026-999	Description: Laboratory Services
Client Sample ID: <b>B</b>	Sampled: 01/13/12 00:00
Lab Sample ID: <b>1201170-01</b>	Sampled By: KSJ
Matrix: Water	Received: 01/14/12 09:00
Unit: ug/L	Prepared: 01/16/12 By: DLV
Dilution Factor: 1	Analyzed: 01/16/12 By: DLV
QC Batch: 1201304	Analytical Batch: 2A17008

### Volatile Organic Compounds by EPA Method 8260B

CAS Number	Analyte	Analytical Result	RL
79-01-6	Trichloroethene	110	1.0
<b>Surrogates:</b>			
	<i>% Recovery</i>	<i>Control Limits</i>	
	<i>Dibromofluoromethane</i>	<i>101</i>	<i>85-118</i>
	<i>1,2-Dichloroethane-d4</i>	<i>104</i>	<i>87-122</i>
	<i>Toluene-d8</i>	<i>99</i>	<i>85-113</i>
	<i>4-Bromofluorobenzene</i>	<i>99</i>	<i>82-110</i>

## QUALITY CONTROL REPORT

### Volatile Organic Compounds by EPA Method 8260B

Analyte	Sample Conc.	Spike Qty.	Result	Spike % Rec.	Control Limits	RPD	RPD Limits	RL
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**QC Batch: 1201304** 5030B Aqueous Purge & Trap/USEPA-8260B

#### Method Blank

Unit: ug/L

Analyzed: 01/16/2012 By: DLV

Analytical Batch: 2A17008

Trichloroethene	<1.0			1.0
-----------------	------	--	--	-----

**Surrogates:**

Dibromofluoromethane	101	85-118
1,2-Dichloroethane-d4	104	87-122
Toluene-d8	100	85-113
4-Bromofluorobenzene	99	82-110

#### Laboratory Control Sample

Unit: ug/L

Analyzed: 01/16/2012 By: DLV

Analytical Batch: 2A17008

Trichloroethene	40.0	<b>40.8</b>	102	82-119	--	20	1.0
-----------------	------	-------------	-----	--------	----	----	-----

**Surrogates:**

Dibromofluoromethane	102	85-118
1,2-Dichloroethane-d4	104	87-122
Toluene-d8	101	85-113
4-Bromofluorobenzene	101	82-110



## STATEMENT OF DATA QUALIFICATIONS

All analyses have been validated and comply with our Quality Control Program.  
No Qualification is required.

<b>Chain of Custody</b> <b>BARR</b> 4700 West 77th Street Minneapolis, MN 55435-4803 (952) 832-2600										E-1201170 3-1 Tm2911 Rack# 724W.										Number of Containers/Preservative Water Soil VOCs (HCl) #1 SVOCs (unpreserved) #2 Dissolved Metals (HNO <sub>3</sub> ) Total Metals (HNO <sub>3</sub> ) General (unpreserved) #3 Diesel Range Organics (HCl) Nutrients (H <sub>2</sub> SO <sub>4</sub> ) #4 VOCs (tared MeOH) #1 GRO, BTEX (tared MeOH) #1 DRO (tared unpreserved) Metals (unpreserved) SVOCs (unpreserved) #2 % Solids (plastic vial, unpres.)										COC <u>1</u> of <u>1</u>													
Project Number: <u>23/27-0169410205</u>										Project Name: <u>General Mills E. Hemopin</u>										Sample Origination State <u>MN</u> (use two letter postal state abbreviation)										COC Number: <u>No 36858</u>										Total Number Of Containers Project Manager: <u>Sara Ramsden</u> Project QC Contact: <u>MDD</u> Sampled by: <u>KSJ</u> Laboratory: <u>TRI-MATRIX</u>			
Location		Start Depth		Stop Depth		Depth Unit (m./ft. or in.)		Collection Date (mm/dd/yyyy)		Collection Time (hh:mm)		Matrix		Type		VOCs (HCl) #1		SVOCs (unpreserved) #2		Dissolved Metals (HNO <sub>3</sub> )		Total Metals (HNO <sub>3</sub> )		General (unpreserved) #3		Diesel Range Organics (HCl)		Nutrients (H <sub>2</sub> SO <sub>4</sub> ) #4		VOCs (tared MeOH) #1		GRO, BTEX (tared MeOH) #1		DRO (tared unpreserved)		Metals (unpreserved)		SVOCs (unpreserved) #2				% Solids (plastic vial, unpres.)	
1. <u>B 06</u>								<u>1/13/2012</u>				<u>✓</u>		<u>✓</u>		<u>4</u>																											
2.																																											
3.																																											
4.																																											
5.																																											
6.																																											
7.																																											
8.																																											
9.																																											
10.																																											

**Common Parameter/Container - Preservation Key**

#1 - Volatile Organics = BTEX, GRO, TPH, 8260 Full List

#2 - Semivolatile Organics = PAHs, PCP, Dioxins, 8270 Full List, Herbicide/Pesticide/PCBs

#3 - General = pH, Chloride, Fluoride, Alkalinity, TSS, TDS, TS, Sulfate

#4 - Nutrients = COD, TOC, Phenols, Ammonia Nitrogen, TKN


Relinquished By: <u>Kim Shannessa</u>	On Ice? <u>Y</u> N	Date: <u>1/13/2012</u>	Time:	Received by: <u>[Signature]</u>	Date:	Time:
Relinquished By:	On Ice? Y N	Date:	Time:	Received by:	Date:	Time:

Samples Shipped VIA: ☐ Air Freight ☒ Federal Express ☐ Sampler ☐ Other: \_\_\_\_\_

Air Bill Number: 8753 9721 9678

Distribution: White-Original Accompanies Shipment to Lab; Yellow - Field Copy; Pink - Lab Coordinator

## SAMPLE RECEIVING / LOG-IN CHECKLIST

 <b>TRIMATRIX</b> LABORATORIES		Client: <u>Barr</u>		Work Order #: <u>1201170</u>	
		Receipt Record Page/Line #: <u>3-1</u>		New / Add To: _____ Project Chemist: _____ Sample #s: _____	

Recorded by (initials/date): <u>LR 11/14/12</u>		<input checked="" type="checkbox"/> Cooler <input type="checkbox"/> Box <input type="checkbox"/> Other: _____	Qty Received: <u>1</u>	<input checked="" type="checkbox"/> IR Gun (#202) Thermometer Used: <input type="checkbox"/> Digital Thermometer (#54) <input type="checkbox"/> See Additional Cooler Information Form <input type="checkbox"/> Other (# _____)
---	--	---	------------------------	---

Cooler #	Time	Cooler #	Time	Cooler #	Time	Cooler #	Time
<u>TM 2911</u>	<u>0919</u>						
Custody Seals:		Custody Seals:		Custody Seals:		Custody Seals:	
<input checked="" type="checkbox"/> None <input type="checkbox"/> Present / Intact <input type="checkbox"/> Present / Not Intact		<input type="checkbox"/> None <input type="checkbox"/> Present / Intact <input type="checkbox"/> Present / Not Intact		<input type="checkbox"/> None <input type="checkbox"/> Present / Intact <input type="checkbox"/> Present / Not Intact		<input type="checkbox"/> None <input type="checkbox"/> Present / Intact <input type="checkbox"/> Present / Not Intact	
Coolant Location:		Coolant Location:		Coolant Location:		Coolant Location:	
Dispersed / <u>Top</u> / Middle / Bottom		Dispersed / Top / Middle / Bottom		Dispersed / Top / Middle / Bottom		Dispersed / Top / Middle / Bottom	
Coolant/Temperature Taken Via:		Coolant/Temperature Taken Via:		Coolant/Temperature Taken Via:		Coolant/Temperature Taken Via:	
<input type="checkbox"/> Loose Ice / Avg 2-3 containers <input checked="" type="checkbox"/> Bagged Ice / Avg 2-3 containers <input type="checkbox"/> Blue Ice / Avg 2-3 containers <input checked="" type="checkbox"/> None / Avg 2-3 containers		<input type="checkbox"/> Loose Ice / Avg 2-3 containers <input type="checkbox"/> Bagged Ice / Avg 2-3 containers <input type="checkbox"/> Blue Ice / Avg 2-3 containers <input checked="" type="checkbox"/> None / Avg 2-3 containers		<input type="checkbox"/> Loose Ice / Avg 2-3 containers <input type="checkbox"/> Bagged Ice / Avg 2-3 containers <input type="checkbox"/> Blue Ice / Avg 2-3 containers <input checked="" type="checkbox"/> None / Avg 2-3 containers		<input type="checkbox"/> Loose Ice / Avg 2-3 containers <input type="checkbox"/> Bagged Ice / Avg 2-3 containers <input type="checkbox"/> Blue Ice / Avg 2-3 containers <input checked="" type="checkbox"/> None / Avg 2-3 containers	
Alternate Temperature Taken Via:		Alternate Temperature Taken Via:		Alternate Temperature Taken Via:		Alternate Temperature Taken Via:	
<input type="checkbox"/> Temperature Blank (TB) <input type="checkbox"/> 1 Container		<input type="checkbox"/> Temperature Blank (TB) <input type="checkbox"/> 1 Container		<input type="checkbox"/> Temperature Blank (TB) <input type="checkbox"/> 1 Container		<input type="checkbox"/> Temperature Blank (TB) <input type="checkbox"/> 1 Container	
Recorded °C	Correction Factor °C	Actual °C	Recorded °C	Correction Factor °C	Actual °C	Recorded °C	Correction Factor °C
Temp Blank:			Temp Blank:			Temp Blank:	
TB location: Representative / Not Representative			TB location: Representative / Not Representative			TB location: Representative / Not Representative	
1	<u>4.8</u>	<u>4.8</u>	1			1	
2	<u>4.6</u>	<u>4.6</u>	2			2	
3	<u>5.1</u>	<u>5.1</u>	3			3	
Average °C			Average °C			Average °C	
<u>4.8</u>							
<input checked="" type="checkbox"/> Cooler ID on COC? <input type="checkbox"/> VOC Trip Blank received?			<input type="checkbox"/> Cooler ID on COC? <input type="checkbox"/> VOC Trip Blank received?			<input type="checkbox"/> Cooler ID on COC? <input type="checkbox"/> VOC Trip Blank received?	

If any shaded areas checked, complete Sample Receiving Non-Conformance Form

<b>Paperwork Received</b> N/A Yes No <input checked="" type="checkbox"/> Chain of Custody record(s)? If No, COC Initiated By: _____ Rec'd for Lab Signed/Date/Time? _____ Shipping document? _____ Other: _____ COC ID #s: _____ <input type="checkbox"/> TriMatrix <input checked="" type="checkbox"/> Other (Name or ID#): <u>36858</u>		<b>Check Sample Preservation</b> N/A Yes No <input checked="" type="checkbox"/> Average sample temperature ≤ 6° C? <input checked="" type="checkbox"/> Completed Sample Preservation Verification Form? <input checked="" type="checkbox"/> Samples preserved correctly? If "No", added orange tag? Received pre-preserved VOC soils? <input type="checkbox"/> MeOH <input type="checkbox"/> Na <sub>2</sub> SO <sub>4</sub>	
<b>Check COC for Accuracy</b> Yes No <input checked="" type="checkbox"/> Sample ID matches COC? <input checked="" type="checkbox"/> Sample Date and Time matches COC? <input checked="" type="checkbox"/> Container type completed on COC? <input checked="" type="checkbox"/> All container types indicated are received? <b>Sample Condition Summary</b> N/A Yes No <input checked="" type="checkbox"/> Broken containers/lids? <input checked="" type="checkbox"/> Missing or incomplete labels? <input checked="" type="checkbox"/> Illegible information on labels? <input checked="" type="checkbox"/> Low volume received? <input checked="" type="checkbox"/> Inappropriate containers received? <input checked="" type="checkbox"/> VOC vials / TOX containers have headspace? <input checked="" type="checkbox"/> Extra sample locations / containers not listed on COC?		<b>Check for Short Hold-Time Prep/Analyses</b> <input type="checkbox"/> Bacteriological <input type="checkbox"/> Air Bags <input type="checkbox"/> EnCores / Methanol Pre-Preserved <input type="checkbox"/> Formaldehyde/Aldehyde <input type="checkbox"/> Green-tagged containers <input type="checkbox"/> Yellow/White-tagged 1L ambers (SV Prep-Lab) <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <b>AFTER HOURS ONLY:</b>          COPIES OF COC TO LAB AREA(S)  <input type="checkbox"/> NONE RECEIVED  <input checked="" type="checkbox"/> RECEIVED, COCs TO LAB(S)       </div>	
<b>Notes</b> <u>Rush 48 hr. TAT</u>		<input type="checkbox"/> Trip Blank received <input type="checkbox"/> Trip Blank not listed on COC <input type="checkbox"/> No COC received, Proj. Chemist reviewed (Init/Date) _____ <input type="checkbox"/> No analysis requested, Proj. Chemist completed (Init/Date) _____	
Cooler Received (Date/Time): <u>11/14/12 0900</u>		Paperwork Delivered (Date/Time): <u>11/14/12 0921</u> ≤ 1 Hour Goal Met? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	

Log In Forms - Receiving\_Log-In\_Checklist

revision: 3.0

## **Attachment B**

### **SOP for Direct-Push Soil and Groundwater Sample Collection**

# STANDARD OPERATING PROCEDURE

## Direct-Push Soil and Groundwater Sample Collection (Geoprobe®)

Revision 4

March 23, 2010

Approved By: Andrea Nord Andrea Nord 3/23/10  
Print QA Manager(s) Signature Date

KEVIN MCGILP Kevin McGilp 3/23/10  
Print Field Technician(s) Signature Date



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Minneapolis, MN • Hibbing, MN • Duluth, MN • Ann Arbor, MI • Jefferson City, MO • Bismarck, ND

Annual Review of the SOP has been performed  
and the SOP still reflects current practice.

Initials: <u>JWJ</u>	Date: <u>4-10-11</u>
Initials: _____	Date: _____
Initials: _____	Date: _____
Initials: _____	Date: _____
Initials: _____	Date: _____

# **Standard Operating Procedures for the Direct-Push Soil and Groundwater Sample Collection (Geoprobe®)**

## **Purpose**

The purpose of this standard operating procedure (SOP) is to describe the procedures for the collection of soil and/or groundwater samples when Geoprobe® field methods are used.

## **Applicability**

This SOP will be utilized wherever direct-push (i.e., Geoprobe®) methods are employed for the retrieval of soil or groundwater from designated sampling locations.

## **Equipment**

Direct-push soil sampling rig  
Direct-push sampler liner  
Direct-push probe  
Extension rods  
Screen (four-foot lengths)  
Polyethylene tubing  
Pump (peristaltic or vacuum)  
Pre-cleaned-certified Sampling Containers  
Alconox®  
Deionized or tap water  
Stainless steel spoons, scoops or trowels  
Clean pair of surgical gloves  
Appropriate personal protective equipment  
Field notebook and/or Field Log Data Sheets  
Chain of Custody Form  
Sample Labels  
Coolers  
Bagged ice  
Tape  
Field balance (for soils)  
Water-proof ink pen

## **References**

Procedures for Ground Water Monitoring, Minnesota Pollution Control Agency Guidelines, December 1986  
EPA: Title 40 of the Code of Federal Regulations

## **Responsibilities**

The environmental technician(s) or geologist is responsible for the proper collection of soil and water samples, sample identification, quality control procedures, and documentation.

## **Procedure**

1. Approximately one week before the sampling event, the appropriate sample containers should be ordered from the laboratory.
2. Before leaving for the site, account for all the containers.
3. When the sample is ready to be collected label the containers with the following information:
  - Project number
  - Location sampled
  - Individual collecting the samples
  - Date and time of sample collection
  - Sample analysis (if required by the laboratory)

**Note:** Use an indelible permanent pen to avoid ink bleeding.

4. Put on a new pair of disposable sampling gloves at each sampling location.

## ***Soil Sampling with a Direct-push Soil Boring Rig:***

### ***A. Preparation of Soil Sampling Equipment***

All soil sampling equipment will be carefully cleaned before use. All sampling tools including stainless steel spoons/scoops/trowels will be cleaned before use and in between sampling locations by cleaning with deionized or tap water and Alconox<sup>®</sup>, using a brush if necessary to remove particulate matter or films and rinsed thoroughly with deionized water. To prevent sample cross-contamination, the sampler will put on a new pair of disposable sampling gloves at each sampling location. Direct-push sampler liners (soils) are one-time use and disposable.

### ***B. Soil Sample Collection***

Soils are generally continuously sampled using the direct push method. This method generally utilizes steel drive rods and a 2-inch outside diameter (O.D.) soil core sampler with a dedicated 1.75-inch inside diameter (I.D) removable acetate liner. The probe rods and sampling unit are driven to the desired sampling depth by the static weight of the carrier vehicle and hydraulic hammer percussion. Two or four-foot sample cores are typically collected. The assembly is brought to the surface and the soil sample is exposed by cutting open the acetate plastic liner. In most investigations, the entire cores are field screened for moisture, odor, oil sheen, discoloration and the presence of organic soil vapors and classified in accordance with ASTM D-2488, Standard Practice for Description and Identification of Soils (Visual/Manual Method.) Soil sample field screening procedures are described in a separate standard operating procedure

#### **1. Collecting Volatile Organic Samples**

It is important to note that there are different jar sizes and sampling media available for collecting a soil sample for volatile organic compounds (VOCs). The table below

describes the sample volumes and preservation techniques for the most common sampling media.

<b>Summary of Typical Sampling Media and Soil Volumes Used for Volatile Organic Compound Determination</b>			
VOC Sample Media	Preservative	Volume of Preservative (mL)	Volume of Sample (g)
2 oz. glass jar with PTFE-lined lid	MeOH, cool 4 °	10	10
	MeOH, cool 4 °	25	25
4 oz. glass jar with PTFE-lined lid	MeOH, cool 4 °	10	10
	MeOH, cool 4 °	25	25
Encore <sup>®</sup> Sampler			
5 gram device	Freeze or extrude into chemical preservative	Maintain a 1:1 ratio of soil to preservative if chemical preservation is used.	5
25 gram device	Freeze or extrude into chemical preservative	Maintain a 1:1 ratio of soil to preservative if chemical preservation is used.	25
Terracore <sup>®</sup> Kit			
1 MeOH and 2 water preserved glass vial	MeOH, cool 4 °	5	5
	Water Submersion, cool 4 °	5	5
1 MeOH and 2 sodium bisulfite preserved glass vials	MeOH, cool 4 °	5	5
	Sodium Bisulfite, cool 4 °	5	5

Note: Samples for volatile analysis should be collected prior to any other analysis.

- A. Before beginning the collection of VOC soil samples, verify field balance using a 50 gram weight. If the balance is off by  $\pm 5$  grams, recalibrate the instrument following the manufacturer's recommendations.
- B. Cut open the liner using a knife or similar utensil.
- C. Because certain regulations do not allow a weighed sample to be submitted for analysis, it is recommended that the desired weight of soil be weighed using a field balance to gauge the approximate volume of soil (i.e. typically 5, 10 or 25 grams of soil) required to achieve the appropriate weight required for VOC

analysis. Using a stainless-steel spoon/trowel and a field balance, collect the desired grams of soil in a laboratory-provided tared sample container. Once the volume of soil is approximated, the sample aliquot is discarded. Then, collect another equal aliquot of soil for preservation and analysis.

Depending on the laboratory that supplied the container, methanol may be provided in a snap-cap vial that will be opened and poured over the soil in the pre-tared container or the container will be received with the appropriate volume of methanol already added. In this case, avoid splashing the methanol when adding the soil volume. The VOC ration must be 1:1 soil to methanol.

- D. Wipe the jar lip and screw threads to remove soil and ensuring a tight seal with the lid of the container.
  - E. Cool the sample to approximately 4°C immediately after collection.
2. Collecting Semivolatile Organic or Metals Samples (or any other soil sample)
- A. Cut open the liner using a knife or similar utensil.
  - B. Retrieve sample using a clean stainless steel spoon/trowel. Fill sample jar, wipe the jar lip and screw threads to remove soil and ensuring a tight seal with the lid of the container. No preservatives are required for soil samples except VOCs.
  - C. Cool the sample to approximately 4°C immediately after collection.

### ***Groundwater Sampling with a Direct-push Soil Boring Rig:***

Groundwater samples will be collected by advancing the direct-push probe to the desired sampling depth. When the sampling depth is reached, small diameter extension rods will be run through the steel probe rods to push out the expendable drive point. Next, a one-inch screen (four-foot length) is extended into the formation. Following screen placement, polyethylene tubing is placed into the temporary well, and a peristaltic pump (or equivalent) is used to draw water samples to the surface to be placed in appropriate vials or bottles for laboratory analysis.

After each well is constructed, the probe rods are washed in an Alconox<sup>®</sup>/water mixture and rinsed with water. The polyethylene tubing is discharged after each sample was collected and new tubing used for the collection of the next sample. The temporary well locations will be abandoned following all State regulations.

Container volume, type, and preservative are important considerations in groundwater sample collection. Container volume must be adequate to meet laboratory requirements for quality control, split samples, or repeat examinations. The container type or construction varies with the analysis required: (1) septum-sealed 40-ml glass vial is used for volatile organic compounds; (2) semivolatile analyses usually require a glass container (note—amber-tinted glass prevents sunlight from affecting the sample); and (3) polyethylene containers are used for general parameters, metals, and inorganics. The analytical laboratory will preserve the container before shipment. Preservation and shelf life vary; contact the laboratory to determine if an on-hand container is still useful.

## **A. Groundwater Sample Collection**

1. **Volatiles**—Use caution because concentrated acid may be present. Do not rinse or overfill glass vials. Hold bottle in one hand, the cap right side up in the other. Pour slowly, avoiding air bubbles and overfilling the vial. Cap tightly, invert the bottle, and tap gently. If any air bubbles appear in the vial, discard and collect sample in a new vial. After collecting the required number of vials (usually sets of 2 or 3, depending on the laboratory), label them with the necessary information, insert them in a Ziplock<sup>®</sup> plastic bag, and place in a cooler with ice.
2. **Semivolatiles**—Fill container slowly with a minimum headspace and cap tightly. Do not rinse glass containers. Place container directly in a cooler with ice.
3. **Filtered Metals**—Typically field filtering of groundwater samples collected from a Geoprobe<sup>®</sup> boring is not advised. Undeveloped temporary borings of this type will likely contain significant solids that would require several attempts to filter adequately. In these cases, the laboratory(ies) can perform this filtering, if necessary. However, this would require an **unpreserved** aliquot of sample for filtration and preservation (of nitric acid) at the laboratory. Should field filtering be required, see the Barr Engineering Co. Standard Operating Procedure for Filtering Groundwater Samples). Pour sample into metals sample container, minimizing headspace and avoiding spillage. Use caution handling metals containers because of nitric acid. Place directly in a cooler with ice.
4. **Other Organics or Inorganics**—Containers may contain acid(s), use caution when handling. Fill containers appropriately, rinsing any unpreserved containers three times, minimizing splashing and spillage. Place container directly in a cooler with ice.

## **Quality Control Samples**

The effectiveness of the sample handling techniques is monitored by collecting both preserved and unpreserved field blank samples. For additional information, consult the Barr Engineering Co. SOP for the Collection of Quality Control Samples.

Field (or Masked) duplicate samples will be collected to measure relative sampling (and laboratory) precision. The ratio of quality control samples are generally 1 field blank/field duplicate sample per twenty samples; however, specific project requirements may be determined by the QAPP/SAP for the project. These samples are collected at the same time using the same procedures, equipment, and types of containers as the required samples. They are also preserved in the same manner and are either co-located or split and submitted for the same analyses as the native sample(s).

Trip blank samples are only applicable when sampling/analyzing for volatile organics. Their purpose is to determine if contamination has occurred as a result of improper sample container cleaning, contaminated blank source water, sample contamination during storage and transport due to exposure to volatile organics, or other environmental conditions during sampling and analysis. The water will be free of contaminants. The trip blanks are prepared, sealed and labeled appropriately at the lab, and transported to the field in the same containers as the sample vials. The trip blank samples are not opened in the field. They are transferred

to the coolers designated for volatile sample storage and are transported with the project samples to the analytical laboratory.

Field (or rinsate) blank samples are used to evaluate the effects of sampling cross-contamination caused by inadequately decontaminated equipment. Their purpose is to determine if contamination has occurred as a result of improper equipment cleaning. Field blank samples are prepared onsite by pouring analyte-free water through decontaminated sample collection equipment (bailer, pump, tubing, hoses, stainless-steel bowls, trowels, etc.) and collecting the rinsate in the appropriate sample container. The field blank samples will be handled in the same manner as the sample group for which they are intended (i.e., blanks will be stored and transported with the sample group).

The volume of the sample obtained should be sufficient to perform all required analyses with an additional amount collected to satisfy the needs for quality control, split samples, or repeat examinations. The QA Staff should be consulted for any specific volume requirements.

The elapsed time between sample collection and initiation of each laboratory analysis will fall within a prescribed time frame. Holding times for samples required by this project are prescribed by EPA: Title 40 of the Code of Federal Regulations.

### **Water and Soil Sample Storage**

The samples will be bubble wrapped or bagged immediately after collection, stored in a sample cooler, packed on double bagged wet ice and accompanied with the proper chain of custody documentation. Samples will be kept cold (approximately 4°C) until receipt at the laboratory, where they are to be stored in a refrigerated area. Custody seals may be present, but at minimum, the coolers must be taped shut with three straps of packing tape. All samples will be kept secured to prevent tampering. If sample coolers are left in a vehicle or field office for temporary storage, the area will be locked and secured. The coolers must be delivered to the laboratory via hand or over night delivery courier in accordance with all Federal, State and Local shipping regulations.

**Note:** Samples may have to be stored indoors in winter to prevent freezing.

### **Interferences/Discussion**

Volatile and low-level mercury samples must be collected prior to any other analyses and metals must be collected prior to cyanide samples to avoid possible cross-contamination or other potential data quality issues. After collection, all samples should be handled as few times as possible. Samplers should use extreme care to ensure that samples are not contaminated. If samples are placed in a cooler, samplers should ensure that melted ice cannot cause sample containers to become submerged, as this may result in cross-contamination. Plastic bags, such as Ziplock® bags, should be used when small sample containers (e.g., VOC vials) are placed in coolers to prevent cross-contamination.

Some compounds can be detected in the parts per billion and/or parts per trillion range. Extreme care will be taken to prevent cross-contamination of these samples. A clean pair of new, disposable gloves will be worn for each sample location. Sample containers for source samples or samples suspected of containing high concentrations of contaminants are placed in separate plastic bags and coolers immediately after collecting, preserving and tagging.

Sample collection activities will proceed progressively from the least contaminated area to the most contaminated area (when known).

## **Disposal**

All waste generated by this process will be disposed of in accordance with Federal, State and Local regulations. Where reasonably feasible, technological changes have been implemented to minimize the potential for environmental pollution.

## **Documentation**

The technician(s) will document the type and number of samples collected during each field event. All sample information will be documented in the field notebook, field log data sheet and chain-of-custody record.

## **Attachments**

- Attachment 1: Chain of Custody Form
- Attachment 2: Sample Label
- Attachment 3: Custody Seal – if applicable
- Attachment 4: Field Sampling Report
- Attachment 5: Field Log Data Sheet

## Rev. 4: 03/23/2010

Attachment 2  
Example - Sample label



Client \_\_\_\_\_  
Project Number, \_\_\_\_\_  
Date: \_\_\_\_\_ Time \_\_\_\_\_  
Preservative: \_\_\_\_\_  
Sampled By: \_\_\_\_\_  
Sample Location: \_\_\_\_\_  
\_\_\_\_\_

Attachment 3  
Custody Seal – if applicable

<b>Custody Seal</b>	
Date _____	Project _____
Signature _____	Container# _____ of _____

Attachment 4  
Field Sampling Report



**FIELD SAMPLING REPORT**

---

**Date:**

**Project:**

**Contact:**

Barr Engineering Company  
4700 W. 77th Street  
Minneapolis, MN 55435-4803

**Field Sampling**

**Field Report**

Attachments:

- |   |   |
|---|---|
| • | • |
| • | • |
| • | • |
| • | • |

**Laboratory Analysis Status**


\_\_\_\_\_  
<Name inserts here>  
Environmental Technician

Document1

---

Barr Engineering Company • 4700 W. 77th Street • Minneapolis, MN 55435-4803 • 952/832-2600

# Attachment 5 Field Log Data Sheet



**BARR**

Barr Engineering Company  
Field Log Data Sheet  
Soil Samples

Client:						Number of Containers/ Analysis <div style="display: flex; flex-direction: row-reverse; justify-content: space-between;"> <div style="writing-mode: vertical-rl; transform: rotate(180deg);">Other:</div> <div style="writing-mode: vertical-rl; transform: rotate(180deg);">Moisture</div> <div style="writing-mode: vertical-rl; transform: rotate(180deg);">PCRA Metals</div> <div style="writing-mode: vertical-rl; transform: rotate(180deg);">PCB</div> <div style="writing-mode: vertical-rl; transform: rotate(180deg);">WIDRO</div> <div style="writing-mode: vertical-rl; transform: rotate(180deg);">WIGRO</div> <div style="writing-mode: vertical-rl; transform: rotate(180deg);">VOC</div> <div style="writing-mode: vertical-rl; transform: rotate(180deg);">PAH</div> <div style="writing-mode: vertical-rl; transform: rotate(180deg);">SVOC</div> <div style="writing-mode: vertical-rl; transform: rotate(180deg);">Other:</div> <div style="writing-mode: vertical-rl; transform: rotate(180deg);">Moisture-plastic vial etc.</div> <div style="writing-mode: vertical-rl; transform: rotate(180deg);">8 oz. Unpres.</div> <div style="writing-mode: vertical-rl; transform: rotate(180deg);">4 oz. Unpres.</div> <div style="writing-mode: vertical-rl; transform: rotate(180deg);">2 oz. Unpres.</div> <div style="writing-mode: vertical-rl; transform: rotate(180deg);">2 oz. Pres.</div> </div>																		
Location:																								
Project #:																								
Project Name:																								
Sample Identification	Collection		Matrix		Type																			
	Date	Time	Soil	Sludge	Grab	Comp.	QC	2 oz. Pres.	2 oz. Unpres.	4 oz. Unpres.	8 oz. Unpres.	Moisture-plastic vial etc.	Other:	SVOC	PAH	VOC	WIGRO	WIDRO	PCB	PCRA Metals	Moisture	Other:	Other:	
1.																								
2.																								
3.																								
4.																								
5.																								
6.																								
7.																								
8.																								
9.																								
10.																								
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16.																								
17.																								
18.																								
19.																								
20.																								

## **Attachment C**

### **SOP for Groundwater Samples from Monitoring Wells**

## STANDARD OPERATING PROCEDURE

### Collection of Each Type of Groundwater Sample from Monitoring Wells, Residential Wells and Residential Systems

Revision 3

March 23, 2010

Approved By:

<u>Andrea Nord</u>	<u>Andrea Nord</u>	<u>3-23-10</u>
Print	QA Manager(s)	Signature
<u>Kim Johannessen</u>	<u>Kim Johannessen</u>	<u>3-23-10</u>
Print	Field Technician(s)	Signature
		Date



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Minneapolis, MN • Hibbing, MN • Duluth, MN • Ann Arbor, MI • Jefferson City, MO • Bismarck, ND

Annual Review of the SOP has been performed  
and the SOP still reflects current practice.

Initials: <u>KSJ</u>	Date: <u>4/4/2011</u>
Initials: _____	Date: _____
Initials: _____	Date: _____
Initials: _____	Date: _____
Initials: _____	Date: _____

# **Standard Operating Procedures for the Collection of Each Type of Groundwater Sample from Monitoring Wells, Residential Wells and Residential Systems**

## **Purpose**

The purpose of this procedure is to describe the collection of water samples for volatiles, semivolatiles, metals, inorganics, bacteria, and dioxin from monitoring wells, residential wells and residential systems.

## **Applicability**

This procedure applies to the stabilization of monitoring wells and subsequent collection of groundwater samples by the sampling technician(s). It identifies each container type (volume, construction, preservative) required for each category of analyses, their corresponding holding times and collection procedures from monitoring wells, residential wells and residential systems.

## **Definitions**

**Headspace.** The air space between the container top and the water sample level.

**Holding Time.** Period of time between sample collection and when the sample is analyzed.

**Sample Preservation.** The stability of analytes depends upon the proper preservation technique and preservation acceptance criteria as defined by EPA Title 40 of the Code of Federal Regulations and corresponding method criteria.

## **Equipment**

Sampler media  
Pre-cleaned-certified Sampling Containers  
Coolers  
Ziploc® Baggy  
Ice  
Water-proof ink pen or pencil  
Bailer (Stainless Steel or Polyethylene)  
Nitrile Gloves  
Water Quality Meter  
Sample label  
Chain of Custody Form  
Alconox

## **References**

Quality Assurance Manual: Groundwater and Surface Water Sampling Procedures, Barr Engineering Co.; American Water Works Association: Pocket Guide to Water Sampling; Environmental Sampling, A Summary, the Radian Corporation.  
Ground Water Sampling Guidelines by MPCA  
EPA: Title 40 of the Code of Federal Regulations

## Responsibilities

The Field Operations/QA Officer or the environmental technician(s) will order the sample containers prior to the sampling event. The environmental technician(s) is responsible for the proper collection of monitoring wells, residential wells, and residential system groundwater samples; sample identification; quality control procedures; sample filtering and documentation.

## Procedure

### I. Obtain Sampling Media

Approximately one week before the sampling event, the sample containers should be ordered from the laboratory.

**Note:** Container volume, type, and preservative are important considerations in sample collection. Container volume must be adequate to meet laboratory requirements for quality control, split samples, or repeat examinations. The container type or construction varies with the analysis required. The analytical laboratory will preserve the container before shipment. Preservation and shelf life vary; contact the laboratory to determine if an on-hand container is still useful.

### II. Measure Water Level, Well Depth and Purge

Once the water level and well depth measurements have been taken and the well has been purged in accordance to Barr's Calculation of Purge Volumes for Groundwater Sampling Wells SOP and allowed to stabilize, the technician can begin groundwater sampling.

#### *Stabilization Test Measurements*

Collection of stabilization test measurements shall begin at the same time as groundwater purging prior to sample collection is initiated. Well stabilization measurements will be collected and recorded at the start of the purging process and once every ten minutes during the purging process, with a minimum of one measurement collected per well volume removed. A well volume will be measured as the volume of water that occurs in each well from the base of the well to the water level measurement collected prior to initiation of purging. Once three well volumes have been removed, the well may be sampled after three consecutive measurements, collected at the intervals described above, are within the ranges presented below:

Specific Conductance:	$\pm 5\%$ of the most recent reading (temperature corrected)
pH	$\pm 5\%$ of the most recent reading (in pH units)
Temperature	$\pm 5\%$ of the most recent reading (in degrees Celsius)
Oxidation Reduction Potential (Eh)	$\pm 20$ mV of the most recent reading

Collect samples only after a minimum of three water-column volumes have been purged and stabilization of field water-quality parameters has been demonstrated by meeting the target criteria defined in the preceding paragraph. Field technician will check operator procedures, equipment functioning, and well construction information for potential problems. In particular, field staff will re-evaluate whether or not water is being withdrawn from the appropriate depth to effectively evacuate the well.

If all the checks produce no new insight, a decision might be made to collect samples after five or more water-column volumes have been purged even if field measurements have not stabilized. If the well was purged dry, it shall be allowed to recharge and the samples will be collected.

However, if either circumstance applies, the following procedure is required: Before authorizing the laboratory to analyze the samples, the meaningfulness and value of completing laboratory analysis of the sampling suite will be evaluated by reviewing the results of field measurements, well construction data, site hydrology, etc. Where such data is presented, it will be clearly documented that stabilization was not achieved; at a minimum, this fact will be reported on the field data sheets and in the Field Sampling Report.

### **III. Groundwater Sampling**

#### **1. Monitoring Wells (Permanent or Temporary)**

- 1.a Monitoring wells may either be installed permanently or temporarily. They are constructed for the collection of groundwater samples. These monitoring wells have a wide variety of diameters. Groundwater samples might also be collected out of a pit or a drilled hole.

1. Put on sampling gloves to protect the sample and skin.

**Note:** New sampling gloves are needed for each well. Never reuse old gloves.

2. Prepare sampling containers by filling out the label with the following information:

- Project number
- Location sampled
- Individual collecting the samples
- Date and time of sample collection
- Sample analysis (if required by the lab)

**Note:** Use an indelible permanent pen to avoid ink bleeding.

#### **3. Sampling**

- a. Sampling Technique Using a Polyethylene Bailer (1) or Stainless Steel Bailer (2):

1. Polyethylene bailer and Cord reel and rope— Tie the rope to the bailer and lower the bailer into the well with the cord reel.
2. Remove foil from the bailer top (stainless steel).

3. Connect the rope to the bailer top.
4. Remove foil from the bailer body (stainless steel) and the check valve (Teflon).
5. Connect these two parts together; screw these pieces into the bailer top.
6. Slowly rotate the cord reel to lower the bailer into the top of the water column.

**Note:** Make sure not to stir up the water with the bailer, thus volatilizing the samples.

7. Keep the bailer in the top portion of the water column when collecting the sample.
8. When the bailer is filled, slowly rotate the cord reel to retrieve the bailer out of the well.
9. Collect samples by utilizing steps outlined in this SOP.
10. When all samples are collected, place the samples in a sampling cooler with ice.
11. Disassemble the sampling apparatus.

Step 1: Cut rope several feet above bailer

Step 2: Dismantle bailer assembly

Step 3: Place bailer parts into a dirty bailer cooler (cooler is then sent to lab for decontamination of bailers)

12. After sampling is completed, clean sampling apparatus withalconox or equivalent and distilled water.

b. Sampling technique utilizing a peristaltic pump:

The maximum depth for a peristaltic pump is typically 25 feet, but may be less at higher altitudes.

This pump is used when the water level is within suction lift, i.e., within about 25 feet of the ground surface. It usually is a low-volume suction pump with low pumping rates suitable for sampling shallow, small-diameter wells.

1. Cut tubing to desired length.
2. Connect tubing to pump head, leaving 1 to 2 feet for discharge line.
3. Lower tubing into the well water (1 to 2 feet below surface).

4. Turn on pump and set speed at the desired rate of flow.

2. Residential Sampling—potable water supply

2.a Residential sampling is sampling conducted on a potable water supply. It is very important that these samples are representative of that water supply. The sampling point must be located ahead of any filtering devices or water conditioners. The highest standard of sampling technique is required for residential well sampling.

1. Put on sampling gloves to prevent contamination of the samples..
2. Purge private wells before sampling (including taking pH, conductivity, and temperature).

**Note:** Rule of thumb—at least one well and storage tank volume should be removed. A 15-minute purging period is usually sufficient for residential wells.

3. Prepare sampling containers by filling out the label with the following information:
  - Project number
  - Location sampled
  - Individual collecting the samples
  - Date and time of sample collection
  - Sample analysis (if required by the lab)
4. Unscrew sampling container top (do not let the container or container top touch anything).

**Note:** If applicable, collect the volatile samples first, proceeding to the least volatile.
5. Collect sample from the purge tap.
6. After completing the collection of the samples, place samples in a cooler with ice.
7. Turn off the tap; clean up any mess made by sampling.

3. Residential Systems (water supply system)

3.a Residential systems is sampling done on a water supply system. It must be representative of the water quality of that system. Preferably, a sampling tap will be ahead of the storage tank and close to the well head. Sample collection from this tap in the system must be from a steady stream of water.

1. Select a tap that is free from exterior contamination (remove anything attached to the faucet).

- If bacterial samples are to be collected, flame the end of the tap with a lighter or match to sterilize the tap.
- 2. Put on sampling gloves to prevent contamination of the samples
- 3. Turn on water tap; make sure the water is a steady stream out of the tap.

**Note:** If water is not a steady stream, find a new tap. Also, make sure the tap is not leaking by the valve handle.
- 4. The water tap should be run steadily for two to three minutes or a sufficient time to permit clearing of the service line. Take pH, conductivity, and temperature.
- 5. Prepare sampling containers by filling out the label with the following information:
  - Project number
  - Location sampled
  - Individual collecting the samples
  - Date and time of sample collection
  - Sample analysis (if required by the lab)
- 6. Without changing water flow, the sample(s) can be collected.

**Note:** Make sure there is no water splash up into the sampling container or cap. If applicable, collect the volatile samples first, proceeding to the least volatile.
- 7. Place sampling containers in the appropriate cooler with bagged ice.
- 8. Clean up any mess made by the sampling event.

### 3.b Collecting Field Samples

To ensure sample integrity, collect volatile samples first, then proceed to the least volatile method required for the site.

1. Volatiles and WI Gasoline range organics (WIGRO)– Samples to be analyzed for volatile organics will be collected in two or three 40-ml vials with Teflon®-lined septum caps. Use caution because concentrated acid may be present. Do not rinse glass vials. Hold bottle in one hand, the cap right side up in the other. Allow a slow stream of water to run into the 40-ml vial. The vial should be held at an angle while filling to prevent water from falling directly to the bottom of the container and becoming overly disturbed. While holding the vial vertically, add the water sample until a small meniscus forms on the top of the sample container. Avoid air bubbles and overfilling the vial. Cap tightly, invert the bottle, and tap gently. If any air bubbles appear in the vial, discard and collect sample in a new vial. These samples will be cooled to approximately 4°C. After collecting the required number of vials, insert them in a zip-lock plastic bag and place in a cooler with ice.

If prescribed by site-specific situations a duplicate volatile sample may be collected and field checked with a pH indicator strip to assess the pH of the sample. If the pH is greater than 2, the laboratory will be instructed to reduce the holding time of that day's samples to the 7-day holding period used for unpreserved samples.

2. Semivolatiles (includes: Pesticides, PCB, Herbicides, BNAs, Dioxin and Furans)– Samples to be analyzed for semivolatile organics will be collected in a 1-liter amber glass jar with a Teflon-lined septum cap for each fraction. Fill container slowly with a minimum headspace and cap tightly. Do not rinse glass containers. Place container directly in a cooler with ice. These samples will be cooled to approximately 4°C.

**Note:** For Dioxin and furan analysis, the bottles must be preserved with 80 mg. sodium thiosulfate if they are being collected from a chlorinated source.

3. WI Diesel Range Organics (WIDRO) – Samples to be analyzed for WIDRO are to be collected in a 1-liter amber glass jar with a Teflon-lined septum cap and preserved with 1:1 HCl to a pH or less than 2. Fill container slowly with a minimum of headspace and cap tightly. Do not rinse glass containers. Place container directly into a cooler with ice. These samples will be cooled to approximately 4°C.
4. Other Organics – Containers may contain acid, use caution when handling. Fill containers completely minimizing headspace and avoiding spillage. Place container directly in a cooler with ice.
5. Metals
  - Total Metals – Samples to be analyzed for metals will be collected in a 500-mL or 1-liter polyethylene jar with a polyethylene-lined closure. These samples will be preserved in by the lab with a 1:1 (50%) solution of Nitric Acid to reduce the pH of the sample to less than 2.
  - Filtered Metals – Select the appropriate Corning filter size, either 250-ml or 500-ml volume (see Standard Operating Procedures for filtering groundwater samples). Pour filtered sample into metals sample container, minimizing headspace and avoiding spillage. Use caution handling metals containers because of nitric acid. Place directly in a cooler with ice.
6. Phenolics – Samples to be analyzed for phenol will be collected in a 1-liter glass jar. These samples will be preserved in the field with sulfuric acid to reduce the pH of the sample to less than 2 and cooled to approximately 4°C.
7. Oil and Grease by hexane extraction – Samples to be analyzed for Oil and Grease will be collected in a 1-liter glass jar with a Teflon-lined septum cap preserved to a pH or less than 2 with either 1:1 hydrochloric acid or 1:1 sulfuric acid. These samples will be cooled to approximately 4°C.

8. Cyanide – Groundwater samples to be analyzed for cyanide will be collected in a 1-liter polyethylene container with a polyethylene cap and preserved with sodium hydroxide to pH greater than 12 and cooled to approximately 4°C.
9. Collecting General Chemistry Samples – Samples to be analyzed for sulfate, chloride, carbonate, and bicarbonate will be collected in 1-liter plastic jars. These samples will be cooled to approximately 4°C.
10. Bacteria – Plastic bottles or glass containers preserved with 10 mg of sodium thiosulfate are used for bacterial sample collection. Care should be taken not to contaminate the container before collecting the sample. Fill the container within 1 inch of the top. This allows the laboratory to shake and mix the contents before analysis. Close and seal the Whirl Pak; grasp the wire ends and flip the pack in a circular motion several times and twist the wires together. Pack the containers carefully in a cooler with ice.

#### **IV. Collecting Quality Control Samples**

The effectiveness of the sample handling techniques is monitored by collecting both preserved and unpreserved field blank samples.

Field (or Masked) duplicate samples will be collected to measure relative sampling precision. Five percent of all samples collected are collected in duplicate. These samples are collected at the same time using the same procedures, equipment, and types of containers as the required samples. They are also preserved in the same manner and are either co-located or split and submitted for the same analyses as the required samples.

Trip blanks are only used when sampling for volatile organics. Their purpose is to determine if contamination has occurred as a result of improper sample container cleaning, contaminated blank source water, sample contamination during storage and transport due to exposure to volatile organics, or other environmental conditions during sampling and analysis. Trip blanks are prepared prior to the sampling events by the laboratory providing the sample containers. The water will be free of contaminants. The trip blanks are prepared by the lab, sealed and labeled appropriately at the lab, and transported to the field in the same containers as the sample vials. These blanks are not opened in the field. They are transferred to the coolers designated for volatile sample storage and transport and accompany the samples to the analytical laboratory.

Field blanks (or Rinsate Blanks) are used to evaluate the effects of onsite equipment contaminants. Their purpose is to determine if contamination has occurred as a result of improper equipment cleaning. Field blanks are prepared onsite by pouring analyte-free water through decontaminated sample collection equipment (bailer or pump) and collecting the rinsate in a sample container. The field blanks will be handled in the same manner as the sample group for which they are intended (i.e., blanks will be stored and transported with the sample group).

Some general considerations will be taken into account when planning and conducting sampling operations. The sampler will take into consideration the required sample volumes; sample holding times, sample handling, and special precautions for trace contaminant sampling.

The volume of the sample obtained should be sufficient to perform all required analyses with an additional amount collected to satisfy the needs for quality control, split samples, or repeat examinations. The Laboratory Coordinator should be consulted for any specific volume requirements. Multiple sample containers are always required for volatile organic compound (VOC) analyses.

The elapsed time between sample collection and initiation of each laboratory analysis will fall within a prescribed time frame. Holding times for samples required by this project are prescribed by EPA: Title 40 of the Code of Federal Regulations.

After collection, all samples should be handled as few times as possible. Technicians should use extreme care to ensure that samples are not contaminated. If samples are placed in a cooler, technicians should ensure that melted ice cannot cause sample containers to become submerged, as this may result in cross-contamination. Plastic bags, such as Ziplock® bags, should be used when small sample containers (e.g., VOC vials) are placed in coolers to prevent cross-contamination.

Some compounds can be detected in the parts per billion and/or parts per trillion range. Extreme care will be taken to prevent cross-contamination of these samples. A clean pair of new, disposable gloves will be worn for each sample location. Sample containers for source samples or samples suspected of containing high concentrations of contaminants are placed in separate plastic bags and coolers immediately after collecting, preserving and tagging. Sample collection activities will proceed progressively from the least contaminated area to the most contaminated area (when known).

## **Sample Storage**

Place samples as soon as possible in a cooler containing bagged ice. Samples must be kept cold ( $4 \pm 2^{\circ}\text{C}$ ) at all times until delivery to the laboratory. Custody seals may be present, but at minimum, the coolers must be taped shut with three straps of fiberglass tape. Samples must be secure to prevent tampering with or loss of samples. If sample coolers are left in a vehicle or field office for temporary storage, the area will be locked and secured. The coolers must be delivered to the laboratory via hand or over night delivery courier in accordance with all Federal, State and Local shipping regulations.

**Note:** Samples may have to be stored indoors in winter to prevent freezing.

## **Disposal**

All waste generated by this process will be disposed of in accordance with Federal, State and Local regulations. Where reasonably feasible, technological changes have been implemented to minimize the potential for environmental pollution.


## **Documentation**

The technician(s) will document the groundwater sampling events on field log data sheets, field log cover sheets, and field log data reports. They will also document the type and number of bottles on both the field log data sheet and chain-of-custody record. The analysis for each container and the laboratory used will be documented on the chain-of-custody record.

## **Attachments**

- Attachment 1: Chain of Custody Form
- Attachment 2: Sample Label
- Attachment 3: Custody Seal – if applicable
- Attachment 4: Field Sampling Report
- Attachment 5: Field Log Cover Sheet
- Attachment 6: Field Log Data Sheet

# Attachment 1 Chain of Custody Form

 <b>Chain of Custody</b> 4700 West 77th Street Minneapolis, MN 55435-4803 (952) 832-2600										Number of Containers/Preservative										COC _____ of _____								
										Water					Soil													
Location	Start Depth	Stop Depth	Depth Unit (m./ft. or in.)	Collection Date (mm/dd/yyyy)	Collection Time (hh:mm)	Matrix				Type	VOCs (HCL) #1	SVOCs (unpreserved) #2	Dissolved Metals (HNO <sub>3</sub> )	Total Metals (HNO <sub>3</sub> )	General (unpreserved) #3	Diesel Range Organics (HCL)	Nutrients (H <sub>2</sub> SO <sub>4</sub> ) #4	VOCs (tared MeOH) #1	GRO, BTEX (tared MeOH) #1	DRO (tared unpreserved)	Metals (unpreserved)	SVOCs (unpreserved) #2	% Solids (plastic vial, unpres.)	Total Number Of Containers	Project Manager:	Project QC Contact:	Sampled by:	Laboratory:
						Water	Soil	Grab	Comp.																			
1.																												
2.																												
3.																												
4.																												
5.																												
6.																												
7.																												
8.																												
9.																												
10.																												

Common Parameter/Container - Preservation Key		Relinquished By:		On Ice?	Date	Time	Received by:	Date	Time
#1 - Volatile Organics = BTEX, GRO, TPH, 8260 Full List				Y N					
#2 - Semivolatile Organics = PAHs, PCB, Dioxins, 8270 Full List, Herbicide/Pesticide/PCBs		Relinquished By:		On Ice?	Date	Time	Received by:	Date	Time
#3 - General = pH, Chloride, Fluoride, Alkalinity, TSS, TDS, TS, Sulfate				Y N					
#4 - Nutrients = COD, TOC, Phenols, Ammonia Nitrogen, TKN		Samples Shipped VIA: <input type="checkbox"/> Air Freight <input type="checkbox"/> Federal Express <input type="checkbox"/> Sampler				Air Bill Number:			
		<input type="checkbox"/> Other: _____							

Distribution: White-Original Accompanies Shipment to Lab; Yellow - Field Copy; Pink - Lab Coordinator

H-RLGSTDFORMS/Chain of Custody Form 2009 RLG Rev 09/01/09

Attachment 2  
Example - Sample label



Client \_\_\_\_\_  
Project Number, \_\_\_\_\_  
Date: \_\_\_\_\_ Time \_\_\_\_\_  
Preservative: \_\_\_\_\_  
Sampled By: \_\_\_\_\_  
Sample Location: \_\_\_\_\_  
\_\_\_\_\_

Attachment 3  
Custody Seal – if applicable

<b>Custody Seal</b>	
Date _____	Project _____
Signature _____	Container# _____ of _____

Attachment 4  
Field Sampling Report



**FIELD SAMPLING REPORT**

---

**Date:**

**Project:**

**Contact:**

Barr Engineering Company  
4700 W. 77th Street  
Minneapolis, MN 55435-4803

**Field Sampling**

**Field Report**

Attachments:

- |   |   |
|---|---|
| • | • |
| • | • |
| • | • |
| • | • |

**Laboratory Analysis Status**

\_\_\_\_\_  
<Name inserts here>  
Environmental Technician

Document1

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Barr Engineering Company   4700 W. 77th Street   Minneapolis, MN 55435-4803   952/832-2600

Attachment 5  
Field Log Cover Sheet



**FIELD LOG COVER SHEET  
WATER SAMPLING**

**Client:**

**Project No.:**

**Technician:**

**Sampling Period:**

Date	Temperature	Wind Speed	Wind Direction	Cloud Cover
------	-------------	------------	----------------	-------------

**Summary of Field Activities**

Document1

Barr Engineering Company · 4700 W. 77th Street · Minneapolis, MN 55435-4803 · 952/832-2600

Attachment 6  
Field Log Data Sheet



**Barr Engineering Company**  
**Field Log Data Sheet**

<b>Client:</b>		<b>Monitoring Point:</b>							
<b>Location:</b>		<b>Date:</b>							
<b>Project #:</b>		<b>Sample Time:</b>							
<b>GENERAL DATA</b>		<b>STABILIZATION TEST</b>							
Barr lock:		Time/ Volume	Temp. °C	Cond. @ 25	pH	Eh	D.O.	Turbidity Appearance	
Casing diameter:									
Total well depth:*									
Static water level:*									
Water depth:*									
Well volume: (gal)									
Purge method:									
Sample method:									
Start time:		Odor:							
Stop time:		Purge Appearance:							
Duration: (minutes)		Sample Appearance:							
Rate, gpm:		Comments:							
Volume, purged:									
Duplicate collected?									
Sample collection by:		CO2-	Mn2-	Fe(T)-	Fe2-				
Others present:									
WELL INSPECTION (answer for each category, state if lock replaced, detail any repairs needed on back of form)									
CASING & CAP:		COLLAR:		LOCK:		OTHER:			
MW: groundwater monitoring well		WS: water supply well		SW: surface water		SE: sediment		other:	
VOC-	semi-volatile-	general-	nutrient-	cyanide-	DRO-	Sulfide-			
oil/grease-	bacteria-	total metal-	filtered metal-	methane-		filter-			
Others:									

\*Measurements are referenced from top of riser pipe, unless otherwise indicated.

S:\DM\Templates\FieldLogDataSheet.doc

## **Attachment D**

### **SOP for Air Sample Collection from a Soil Gas Implant**

# STANDARD OPERATING PROCEDURE

## Air Sample Collection from a Soil Gas/Soil Vapor Extraction Point or Implant

Revision 1

March 23, 2010

Approved By:

Andrea Nord

Print

Andrea Nord

QA Manager(s)

Signature

3-23-10

Date

KEVIN MCGILP

Print

Kevin McGilp

Field Technician(s)

Signature

3-23-10

Date



Barr Engineering Company

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Minneapolis, MN • Hibbing, MN • Duluth, MN • Ann Arbor, MI • Jefferson City, MO • Bismarck, ND

Annual Review of the SOP has been performed  
and the SOP still reflects current practice.

Initials: JWJ

Date: 4-9-2011

Initials: \_\_\_\_\_

Date: \_\_\_\_\_

Initials: \_\_\_\_\_

Date: \_\_\_\_\_

Initials: \_\_\_\_\_

Date: \_\_\_\_\_

Initials: \_\_\_\_\_

Date: \_\_\_\_\_

# **Standard Operating Procedures for the Air Sample Collection from a Soil Gas/Soil Vapor Extraction Point or Implant**

## **Purpose**

To describe the procedure for collecting a passive air sample using a Summa<sup>®</sup> canister and a active air sample using a Tedlar<sup>™</sup> bag from a soil gas/soil vapor extraction points and implants for laboratory analysis.

## **Applicability**

The procedure applies to collection of an air sample in a Summa<sup>®</sup> canister and/or Tedlar<sup>™</sup> bag from soil gas/soil vapor extraction points and implants.

## **Equipment**

### **1. Summa<sup>®</sup> canister sample collection**

- 1.1 Summa<sup>®</sup> canister with 1/4-inch stainless steel bellows valve mounted at the top of the canister and a brass cap (provided by laboratory)
- 1.2 7 micron particulate filter (provided by laboratory)
- 1.3 Pressure Gauge (provided by laboratory)
- 1.4 Small diameter Teflon tubing with a compression fitting on one end
- 1.5 Surgical grade silicone tubing
- 1.6 Laboratory grade 3-way valve
- 1.7 9/16-inch wrench
- 1.8 Mobile Lab Sample Control form, chain of custody, and the Barr Field Form

### **2. Tedlar<sup>™</sup> bag sample collection**

- 1.1 New Tedlar<sup>™</sup> bag
- 1.2 Vacuum chamber (“lung sampler”)
- 1.3 Vacuum pump
- 1.4 Surgical grade silicon tubing
- 1.5 Laboratory grade 3-way valve

## References

Air Toxics Ltd, Guide to Air Sampling and Analysis, Canisters and Tedlar Bags Fifth Edition  
Soil Gas Sampling – PRT System by Geoprobe Systems®  
Standard Operating Procedure for Field Measurements of Landfill Gases by Barr Engineering Co.

## Responsibilities

The environmental technician(s) are responsible for collection of the air sample using a Summa® canister and/or a Tedlar™ bag.

## Procedure-

The following procedure(s) should be conducted after purging the gas/vapor source and, if required, field measurements as outlined in the Standard Operating Procedure for Field Measurements of Landfill Gases.

Active landfill gas (LFG) extraction wells may not require an initial gas/vapor purge because active LFG extraction wells are in general continuously drawing gas/vapor from the intended formation.

Static points such as permanent soil vapor monitoring points or temporary soil gas points installed by Direct-Push methods may require soil gas/vapor purging in order to ensure a representative formation sample is acquired. Purging requirements may vary based on site conditions or project requirements but will generally be 3 tubing or pipe volumes of the static source.

Attachment to temporary soil gas points installed by the direct-push method shall be completed in general accordance with the subcontractors SOP and generally includes (but is not limited to) the use of the Geoprobe® Post-Run Tubing (PRT) System. This method in general will incorporate the use of disposable small diameter polyethylene tubing, a stainless steel PRT adaptor, surgical grade silicon tubing and a laboratory grade plastic 3-way valve.

The drill rods equipped with a PRT point holder will be driven to the desired sampling depth. The polyethylene tubing is attached to the PRT adaptor which is then attached to the PRT point holder by a threaded connection at the bottom of the drill string. A plastic 3-way valve is utilized to minimize the gas/vapor source's exposure to ambient atmosphere. The polyethylene source tubing is then connected to the 3-way valve via silicone tubing. The second leg of the 3-way valve is connected to a vacuum source and purging commences. Upon the completion of purging requirements, proceed with operational procedures described below.

The polyethylene tubing will be discarded upon completion of sample collection. The drill string, PRT point holder, PRT adaptor, plastic 3-way valve and lung sampler fittings should be decontaminated in general accordance with the standard operating procedure for Soil Sample Collection Tools Decontamination – Level I. For additional information on the PRT system, see Soil Gas Sampling – PRT System Operation.

## **1. Summa<sup>®</sup> canister sample collection**

- 1.1. Verify the gauge pressure of the Summa<sup>®</sup> canister using a pressure gauge provided by the laboratory.
  - 1.1.1. Confirm that the valve is closed (turn knob clockwise to tighten)
  - 1.1.2. Remove brass cap and attach gauge
  - 1.1.3. Attach brass cap to the fitting on the side of the gauge
  - 1.1.4. Open valve for a few seconds and close quickly
  - 1.1.5. Read vacuum on the gauge
  - 1.1.6. Record the pressure as “Initial Vacuum” on chain of custody and the Barr Field Form
  - 1.1.7. Verify the container valve is closed and remove gauge
  - 1.1.8. Replace the brass cap

The gauge pressure should be greater than 25 inches mercury (in. Hg) of vacuum. If the Summa<sup>®</sup> canisters vacuum pressure is less than 25 in. Hg, the sample container has a leak and should not be used. Notify Barr QA/QC staff to call the laboratory and request and additional canister.

- 1.2. Remove brass cap from the sample container and attach the particulate filter.
- 1.3. Connect one end of the Teflon tubing to the soil gas/soil vapor extraction point or implant at the laboratory grade 3-way valve using surgical grade silicone tubing. Use dedicated tubing for each sampling location.
- 1.4. Connect the open end of the Teflon tubing to the Summa<sup>®</sup> canister at the particulate filter using a 1/4-inch compression fitting.
- 1.5. Verify that connections are tight and the compression fitting is not cross-threaded. Do not over-tighten fittings; finger tight plus 1/4 turn with the wrench is appropriate.
- 1.6. Align 3-way valve so the Summa<sup>®</sup> canister will be drawing directly from the soil gas/soil vapor extraction point or implant.
- 1.7. Open the valve on the Summa<sup>®</sup> canister to allow air flow in. The negative vacuum on the Summa<sup>®</sup> canister will pull in air from the soil gas/soil vapor extraction point or implant. The Summa<sup>®</sup> canister will make an audible noise while it is pulling air in (a 6-liter canister takes approximately 16 seconds to fill). Once the audible noise has stopped and air flow in is complete, close the valve on the Summa<sup>®</sup> canister.
- 1.8. Disconnect the Teflon tubing and re-check the Summa<sup>®</sup> canister pressure (as described previously). The gauge pressure should be near 0 in. Hg. If the canister vacuum is greater than 25 in. Hg, the sample was not collected and repeat the procedure. Write the final vacuum on the chain of custody and on the Barr Field Form.

## **2. Tedlar™ bag sample collection**

- 2.1. Place a new Tedlar™ bag with attached surgical grade silicon tubing into the lung sampler. Use dedicated tubing and Tedlar™ bag for each sampling location.
- 2.2. Connect the loose end of the silicon tubing to the pass through brass barb fitting inside the lung sampler.
- 2.3. Connect external pass through brass barb fitting to the 3-way valve with silicon tubing.
- 2.4. Verify the connections are tight and open valve on Tedlar™ bag the seal or close lung sampler.
- 2.5. Align 3-way valve so the Tedlar™ bag will be drawing directly from the soil gas/soil vapor extraction point or implant.
- 2.6. Apply a vacuum to the lung sampler using the vacuum pump and observe the Tedlar™ bag.
- 2.7. Release the vacuum from the lung sampler when the Tedlar™ bag is approximately 2/3 full. Stopping at 2/3 full will allow for expansion due to temperature or pressure changes.
- 2.8. Open lung sampler and close the valve on the Tedlar™ bag.
- 2.9. Disconnect the Tedlar™ bag from the lung sampler and silicon tubing.

## **Sample Care and Documentation**

### **1. Summa® canister sample**

Environmental technician should record on the Summa® canister tag and in the Field Book: the unique serial number of the Summa® canister, the sample name, the time of sample collection, gauge pressure prior to collection, and gauge pressure following collection. This information should also be reflected on the chain of custody when shipping samples to the laboratory.

### **Interferences/Discussion for Summa® canister**

Samples collected in a Summa® canister should be shipped or stored at ambient temperature and kept out of direct sunlight.

### **2. Tedlar™ bag sample**

Environmental technician should record in the Field Book the sample name and the time of sample collection. This information should also be reflected on the chain of custody if samples are to be shipped to a fixed base laboratory for analysis. If the Tedlar™ bag

samples are analyzed in the field by a mobile laboratory, the mobile laboratory contractor shall record the above described information on the Mobile Lab Sample Control form.

### **Interferences/Discussion for Tedlar™ bag**

Samples collected in a Tedlar™ bag should be kept out of direct sunlight to avoid possible photochemical reactions. DO NOT CHILL. Tedlar™ bag samples should be shipped or stored at ambient temperatures.

### **Sample Storage**

The Summa® canisters and Tedlar™ bags must be stored at ambient temperature until receipt at the laboratory. All samples will be kept secured to prevent tampering. If samples are left in a vehicle or field office for temporary storage, the area will be locked and secured. The samples may be packaged into cardboard boxes and must be delivered to the laboratory via hand or over night delivery courier in accordance with all Federal, State and Local shipping regulations.

### **Documentation**

Environmental technician should record the following on the Summa® canister tag-if applicable, Field Logbook and chain of custody form:

Summa® canisters:

1. unique serial number of the Summa® canister
2. date and time of sample collection
3. gauge pressure prior to collection
4. gauge pressure following collection
5. sample identification
6. name of sample technician

Tedlar™ bags:

1. date and time of sample collection
2. sample identification
3. name of sample technician

### **Attachments**

Attachment 1: Chain of Custody Form

Attachment 2: Sample Label

Attachment 3: Custody Seal – if applicable

Attachment 4: Field Sampling Report

# Attachment 1 Chain of Custody Form

Chain of Custody		Number of Containers/Preservative										COC _____ of _____										
BARR																						
4700 West 77th Street Minneapolis, MN 55435-4803 (952) 832-2600																						
Project Number:												Project Manager:										
Project Name:												Project QC Contact:										
Sample Origination State ____ (use two letter postal state abbreviation)												Sampled by:										
COC Number:												Laboratory:										
Location	Start Depth	Stop Depth	Depth Unit (m./ft. or in.)	Collection Date (mm/dd/yyyy)	Collection Time (hh:mm)	Matrix		Type	VOCs (HCL) #1	VOCs (unpreserved) #2	Disolved Metals (HNO <sub>3</sub> )	Total Metals (HNO <sub>3</sub> )	General (unpreserved) #3	Diesel Range Organics (HCL)	Nutrients (H <sub>2</sub> SO <sub>4</sub> ) #4	VOCs (tared MeOH) #1	GRO, BTEX (tared MeOH) #1	DRO (tared unpreserved)	Metals (unpreserved)	VOCs (unpreserved) #2	% Solids (plastic vial, unpres.)	Total Number Of Containers
						Water	Soil															
1.																						
2.																						
3.																						
4.																						
5.																						
6.																						
7.																						
8.																						
9.																						
10.																						

Common Parameter/Container - Preservation Key		Relinquished By:		On Ice?	Date	Time	Received by:		Date	Time
#1 - Volatile Organics = BTEX, GRO, TPH, 8260 Full List				Y N						
#2 - Semivolatile Organics = PAHs, PCB, Dioxins, 8270 Full List, Herbicide/Pesticide/PCBs				Y N						
#3 - General = pH, Chloride, Fluoride, Alkalinity, TSS, TDS, TS, Sulfate				Y N						
#4 - Nutrients = COD, TOC, Phenols, Ammonia Nitrogen, TKN				Y N						
Samples Shipped VIA: <input type="checkbox"/> Air Freight <input type="checkbox"/> Federal Express <input type="checkbox"/> Sampler		Air Bill Number:								
<input type="checkbox"/> Other: _____										

Distribution: White-Original Accompanies Shipment to Lab; Yellow - Field Copy; Pink - Lab Coordinator

H-RLGSTDFORMS/Chain of Custody Form 2009 RLG Rev 09/01/09

Attachment 2  
Example - Sample label



Client \_\_\_\_\_  
Project Number \_\_\_\_\_  
Date: \_\_\_\_\_ Time \_\_\_\_\_  
Preservative: \_\_\_\_\_  
Sampled By: \_\_\_\_\_  
Sample Location: \_\_\_\_\_  
\_\_\_\_\_

Attachment 3  
Custody Seal – if applicable

<b>Custody Seal</b>	
Date _____	Project _____
Signature _____	Container# _____ of _____

Attachment 4  
Field Sampling Report



**FIELD SAMPLING REPORT**

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**Date:**

**Project:**

**Contact:**

Barr Engineering Company  
4700 W. 77th Street  
Minneapolis, MN 55435-4803

**Field Sampling**

**Field Report**

Attachments:

- |   |   |
|---|---|
| • | • |
| • | • |
| • | • |
| • | • |

**Laboratory Analysis Status**

\_\_\_\_\_  
<Name inserts here>  
Environmental Technician

Document1

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Barr Engineering Company • 4700 W. 77th Street • Minneapolis, MN 55435-4803 • 952/832-2600